
**Data Quality Evaluation and Data Extraction Information for
Environmental Release and Occupational Exposure for
1,2-Dichloroethane**

Systematic Review Support Document for the Risk Evaluation

CASRN: 107-06-2



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This supplemental file contains information regarding the data extraction and quality evaluation results for data sources that were considered for the *Risk Evaluation for 1,2-Dichloroethane* and that underwent systematic review. EPA conducted data extraction, and quality evaluation based on author-reported descriptions and results; additional analyses (*e.g.*, statistical analyses) potentially conducted by EPA are not contained in this supplemental file. EPA used the TSCA systematic review process described in the *Draft Systematic Review Protocol Supporting TSCA Risk Evaluations for Chemical Substances* (also referred to as the '2021 Draft Systematic Review Protocol').

Data that met the RESO screening criteria during the full-text screening was extracted by three data types, general facility, occupational exposure, and environmental release, as explained in Section 6.2 of the 2021 Draft Systematic Review Protocol. Five different data quality evaluation forms were used depending on the data type and condition of use (COU), as explained in Appendix M of the 2021 Draft Systematic Review Protocol. All references with data points containing monitoring data (*e.g.*, measured occupational exposures) underwent data quality evaluation as described in Section M.6.1, using the monitoring data quality metrics. All references with data points containing environmental release data (*e.g.*, measured or calculated quantities of chemical release across facility fence line) underwent data quality evaluation as described in Section M.6.2, using the environmental release data quality metrics. All references with data points containing published models for environmental release or occupational exposure (*e.g.*, published models used to calculate occupational exposure or environmental releases) underwent data quality evaluation as described in Section M.6.3, using the published models for environmental release or occupational exposure quality metrics. All references with data points containing completed exposure or risk assessments (*e.g.*, completed exposure or risk assessments containing a broad range of data types) underwent data quality evaluation as described in Section M.6.4, using the completed exposure or risk assessments quality metrics. All references with data points containing reports for data or information other than exposure or release data (*e.g.*, process description) underwent data quality evaluation as described in Section M.6.5, using the reports for data or information other than exposure or release data quality metrics. The extracted data and their data quality evaluation are available in the tables below.

Additionally, each data type and condition of use is evaluated independently within a given study; therefore, each reference may have more than one overall quality determination (OQD) to reflect the quality of each outcome and the exposures and releases more appropriately as described by the study authors. No OQD is determined for each reference, as a whole, if it contains data from more than one evidence stream.

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HERO ID	Reference	Page
Occupational Exposure		
Monitoring Data		
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4214220	Dow Chemical, (1983). Chemical exposure evaluation: Trichloroethylene production plant (sanitized).	32
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4214360	Envirologic Data, (1992). Assessment of risks from potential exposure to airbourne facility emissions under California AB 2588 for the Rohr Inc Facility Riverside, Calif (vol. 1) (final report) w-letter.	37

1579735	Ethyl Corporation, (1981). Industrial hygiene survey Saytech Chemicals: Date of survey: February 23-26, 1981.	38
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Reports for Data or Information Other than Exposure or Release Data		
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Environmental Releases

Environmental Release Data

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11182960	Earthjustice, (2019). Ethylene dichloride (EDC): Technical report on the conditions of use.	175
6311590	Ecology and Environment, (1992). Site investigation and evaluation of remedial measures report Howard Hughes properties plant site, Los Angeles, California.	176
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2803584	Haas,, R.a. (1981). DCE, DCP and DCEE discharge data for Sept. 1981 from the Rohm and Haas Philadelphia plant's discharges into the city sewer and 1,2-dichloropropane analysis with cover letter.	180
658817	Hart, J. R. (1994). Comparison of emissions from burning hazardous waste in a dry-process cement kiln with emission from burning conventional fossil fuels. Hazardous Waste and Hazardous Materials 11(1):193-199.	181
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10180484	U.S. EPA, (n.d.). AP-42: Chapter 3 - Stationary Internal Combustion Sources.	417
10366189	U.S. EPA, (2020). 2020 CDR: Commercial and consumer use.	418
11181053	U.S. EPA, (2022). DMR Data for TCEP, formaldehyde, trans-1,2-dichloroethylene, 1,1-dichloroethane, and 1,2-dichloroethane.	419
11182966	U.S. EPA, (2022). Chemical repackaging - Generic scenario for estimating occupational exposures and environmental releases (revised draft).	420
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13246591	U.S. EPA, (2025). Toxics Release Inventory (TRI): 1,2-Dichloroethane, reporting years 2019-2024.	423
13246592	U.S. EPA, (2025). Discharge Monitoring Report (DMR): 1,2-Dichloroethane, reporting years 2019-2024.	424
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3840001	U.S. EPA, (1980). Chapter 4.7: Waste solvent reclamation. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.	427
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7315841	U.S. EPA, (1995). AP-42: Chapter 4.12 - Manufacture of rubber products.	431

7325487	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.	432
8347325	U.S. EPA, (2021). National analysis TRI dataset (TRI): Data used for TSCA risk evaluations, reporting year 2019.	448
9102566	U.S. EPA, (2023). AP-42: Chapter 5 - Petroleum industry.	449
5436106	UNEP, (1988). News about chemicals. International Register of Potentially Toxic Chemicals Bulletin 9(1):19.	450
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11927540	VI, (2020). Comment submitted by Richard Krock, Vice President, Regulatory and Technical Affairs, The Vinyl Institute (VI) on 1,1-dichloroethane, trans-1,2-dichloroethylene, and 1,1,2-trichloroethane.	453
13245902	VI, (2026). Vinyl Institute comments on 1,2-dichloroethane regarding working year data and inhalation monitoring data.	454
22964	WHO, (1987). 1,2-Dichloroethane. 62(0):4-1 - 4-21.	455

Study Citation:	Arashidani, K., Nivukoski, U., Inoue, W., Otani, H., Kunugita, N., Kim, H., Katoh, T., Uchiyama, I. (2005). Investigation of air pollution in restaurants and of employees’ personal exposure level. :2718-2722.		
HERO ID:	1949176		
Conditions of Use:	Restaurants		
EXTRACTION			
Parameter	Data		
Number of sites:	2		
Worker activity description:	Indoor Air of restaurant kitchen. The fuel for cooking is electric (A restaurant area: 43m2), charcoal & propane (B restaurant area: 56m2), liquid natural gas (LNG) & charcoal (C restaurant area: 66m2), and propane (D restaurant area: 66m2). Employees were three persons at each restaurant.		
Exposure route:	Inhalation		
Personal sampling data:	<1 (ppb) (Pg. 3)		
Number of workers:	6 (used for measurement)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	Medium	Sampling or analytical methodology is not equivalent to an approved OSHA or NIOSH method and EPA review of information indicates the methodology is acceptable.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from Japan, an OECD country.
	Metric 3: Applicability	Low	Data are for occupational exposure in a restaurant environment, possibly related to an in-scope occupational scenario of use of adhesives in building materials but also could be general population exposure which would be non-occupational in nature.
	Metric 4: Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Monitoring data include sample type (e.g., personal breathing zone) but lacks information on source of 1,2-dichloroethane exposure and other meta-data
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by multiple restaurants being examined but uncertainty is not addressed.
Overall Quality Determination		Low	

Study Citation:	ATSDR, (1996). Toxicological profile for 1,2-dichloroethene.			
HERO ID:	723873			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation & dermal			
Physical form:	Vapor & liquid			
Area sampling data:	Landfill GasSelect US landfills 1985 70 ppb (mean) 3,600 ppb (max)Municipal landfill simulator 1985 210 ppb (mean) 3,260 (max)Long Island, NY 1985 75,600 ppb (max)California 1987 59,000 ppb (max)			
Number of workers:	According to a National Occupational Exposure Survey (NOES) conducted by NIOSH between 1981 and 1983, an estimated 215 workers in the United States are potentially exposed to 1,2-dichloroethene (mixture of cis and trans isomers); an estimated 61 workers in the United States are potentially exposed to cis-1,2-dichloroethene (NIOSH 1988).			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling or analytical methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US
	Metric 3:	Applicability	High	The data are for an occupational scenario (landfill worker) within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	more than 20 years old
	Metric 5:	Sample Size	Medium	Generally a mean or max values was provided; uncertain statistics not discussed.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Monitoring data include sample type (area) but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.
Overall Quality Determination		Low		

Study Citation:	Baek, K. M., Kim, M. J., Seo, Y. K., Kang, B. W., Kim, J. H., Baek, S. O. (2020). Spatiotemporal variations and health implications of hazardous air pollutants in Ulsan, a multi-industrial city in Korea. Atmosphere 11(5):547.			
HERO ID:	6950643			
Conditions of Use:	Intermediate in petrochemical manufacturing			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation			
Physical form:	Vapor			
Area sampling data:	Site A: 0.17 (ppb); Site B: 0.07 (ppb)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Report uses high quality data/techniques/methods that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Korea, an OECD country.
	Metric 3:	Applicability	High	Data are for use as an intermediate in petrochemical manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (mean, SD) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by sampling at 2 sites, but uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	BASF, (2021). Initial study plan: Industrial hygiene qualitative exposure assessment review (redacted).			
HERO ID:	12973392			
Conditions of Use:	Industrial Use - Process Solvent			
EXTRACTION				
Parameter	Data			
Worker activity description:	The report includes job descriptions			
Exposure route:	This report was submitted to the EPA in lieu of generating new inhalation monitoring data to satisfy the test order that was issued in 2021. The existing data report contained information from April 2, 2004, to June 11, 2020, a total of 12 area samples,108 full shift (duration ≥ 255 min) personal breathing zone (PBZ) samples, 8 task length (60 min ≤ duration ≤ 235 min) PBZ samples, 16 report defined short-term exposure limit (9 min ≤ duration ≤ 25 min) PBZ samples, and 2 ceiling exposure limit (duration = 10 min) PBZ samples across SEGs were collected at 1 BASF facility that uses 1,2-DCA to manufacture a herbicide used worldwide in the agriculture industry.			
Exposure duration:	primary 1,2-DCA exposures, exposure duration, shift length, operating days per year, and number of employees per SEG for workers and ONUs. The report includes a labelled map of the site, a detailed 1,2-DCA process use flow diagram and description (including typical flow rates and concentrations), a site-specific PPE Hazard Assessment Table for various process activities, the site LEV program (including air flow rates), the site PPE program, and the site respiratory protection program (including fit testing protocols).			
Exposure frequency:	exposure duration, shift length, operating days			
Number of workers:	number of employees per SEG for workers and ONUs			
Personal protective equipment:	a site-specific PPE Hazard Assessment			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	A modified NIOSH method is used.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data is collected from a facility in the United States.
	Metric 3:	Applicability	High	The data is for the use of 1,2-DCA to manufacture a herbicide.
	Metric 4:	Temporal Representativeness	High	The information describes exposures and activities conducted between 2004 and 2020.
	Metric 5:	Sample Size	High	Discrete samples are provided.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All relevant metadata is provided (sample type, exposure type, sample duration, exposure duration, worker activities, and exposure frequency) is provided. Which results in EPA having a thorough understanding of the processes and activities that could result in exposure.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Variability addressed by monitoring multiple SEGs; Addressed uncertainty in the report with multiple samples over 16 years for some SEGs.
Overall Quality Determination			High	

Study Citation:	BASF, (2006). Letter: Subject: Subject 8EHQ-0502-15135a and 8EHQ-0605-1513b : Response to EPA toxicological evaluation and epidemiological evaluation (EPA letter dtd. November 22, 2005).			
HERO ID:	6570018			
Conditions of Use:	Processing as a reactant			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation			
Personal sampling data:	222 personal samples taken: 90% were below 1 ppm, 12 were >2ppm, 2 samples were >10 ppm			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling or analytical methodology is an approved OSHA or NIOSH method or is well described and found to be equivalent to approved OSHA or NIOSH methods.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The report is more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Monitoring data include sample type (e.g., personal breathing zone) but no other meta-data.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Baur, X., Poschadel, B., Budnik, L. T. (2010). High frequency of fumigants and other toxic gases in imported freight containers—an underestimated occupational and community health risk. Occupational and Environmental Medicine 67(3):207-212.			
HERO ID:	4141092			
Conditions of Use:	Fumigant			
EXTRACTION				
Parameter	Data			
Worker activity description:	Shipping containers			
Area sampling data:	0.1 - >100 (ppm) (Pg. 5)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Germany, an OECD country.
	Metric 3:	Applicability	Uninformative	Data are for use as a fumigant that is not relevant to any in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Uninformative		

Study Citation:	Carbide,, Union (1992). Supplemental information: mortality due to pancreatic and lymphopoietic cancers in chlorohydrin production workers (final report) with cover letter dated 040692.			
HERO ID:	5447107			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter		Data		
Area sampling data:		24.7 (ppm) (1940's) (Pg. 13)		
Number of workers:		107 (Pg. 15)		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Sampling or analytical methodology is not equivalent to an approved OSHA or NIOSH method and EPA review of information indicates the methodology is acceptable. Differences in methods are not expected to lead to lower quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S (Sweden).
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Data from the 1940s.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Monitoring data include sample type (e.g., personal breathing zone) but no other meta-data.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.
Overall Quality Determination			Low	

Study Citation:	Chang, C. P., Lin, T. C., Lin, Y. W., Hua, Y. C., Chu, W. M., Lin, T. Y., Lin, Y. W., Wu, J. D. (2016). Comparison between Thermal Desorption Tubes and Stainless Steel Canisters Used for Measuring Volatile Organic Compounds in Petrochemical Factories. Annals of Occupational Hygiene 60(3):348-360.			
HERO ID:	3120430			
Conditions of Use:	Petrochemical Manufacturing			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation			
Physical form:	Vapor			
Area sampling data:	1.1 (ppb) (Pg. 352)-e differences of the means of the pairwise measurements			
Number of workers:	~11,000 (Pg. 350)			
Comments:	Measured via Thermal desorption tubes; stainless steel cannisters.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data are from Taiwan, a non-OECD country.
	Metric 3:	Applicability	High	Data are for petrochemical production, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (mean) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by testing multiple refineries but uncertainty is not addressed.
Overall Quality Determination		Medium		

Study Citation:	Cheng, T. J., Chou, P. Y., Huang, M. L., Du, C. L., Wong, R. H., Chen, P. C. (2000). Increased lymphocyte sister chromatid exchange frequency in workers with exposure to low level of ethylene dichloride. Mutation Research 470(2):109-114.			
HERO ID:	200265			
Conditions of Use:	Distribution in Commerce			
EXTRACTION				
Parameter	Data			
Worker activity description:	Safety and hygiene officers, operators in control rooms, EDC-unloading operators, field leaders.			
Personal sampling data:	Operators: 0.2 - 0.29 (ppm) (Pg. 2); Unloaders: 0.16 - 0.27 (ppm); Moderate exposure unloaders: 0.77 (ppm)			
Number of workers:	51			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data are from Taiwan, a non-OECD country.
	Metric 3:	Applicability	High	Data are for distribution in commerce, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by testing multiple job types but uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	Cheng, T. J., Huang, M. L., You, N. C., Du, C. L., Chau, T. T. (1999). Abnormal liver function in workers exposed to low levels of ethylene dichloride and vinyl chloride monomer. Journal of Occupational and Environmental Medicine 41(12):1128-1133.			
HERO ID:	200266			
Conditions of Use:	Processing as a reactant			
EXTRACTION				
Parameter	Data			
Worker activity description:	Exhaust gas, VCM unloading, EDC unloading, Oxychlorination, Forman, Safety and Hygiene, Mechanics			
Personal sampling data:	Personal: 0.16 - 333.7 (ppm)			
Area sampling data:	Area: 0.17 - 23.52 (ppm)			
Number of workers:	251			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	EPA review of information indicates the methodology is acceptable. Differences in methods are not expected to lead to lower quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	The data are from a non-OECD country.
	Metric 3:	Applicability	High	Data are for processing as a reactant, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	More than 20 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include most critical metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The monitoring study provides only limited discussion of the variability in the determinants of exposure for the sampled site or sector.
Overall Quality Determination		Medium		

Study Citation:	Cometto-Muniz, J. E., Abraham, M. H. (2015). Compilation and analysis of types and concentrations of airborne chemicals measured in various indoor and outdoor human environments. Chemosphere 127:70-86.			
HERO ID:	3256955			
Conditions of Use:	General indoor concentration			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation			
Area sampling data:	0.6 to 0.7 ug/m3; mean 0.7 ug/m3 in indoor commercial environments (p. 82)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling/analytical methodology is not specified. [Methodology not specified - data was taken from other journal articles]
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from either U.S. or UK (unclear which), both OECD countries. [unclear - assumed U.S. or OECD based on authors (1 U.S, 1 UK)]
	Metric 3:	Applicability	Low	Data are for general indoor air, which may be applicable to multiple in-scope occupational scenarios. [General indoor air concentrations (homes/schools/commercial)]
	Metric 4:	Temporal Representativeness	Medium	Monitoring data were collected at unclear date. Assumed 2000s per reference list, greater than 10 years old but no more than 20 years old. [date of original source unknown - references list generally contains sources from 2000s]
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics. [range of 2 samples given]
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Sample type provided but no other metadata. [no information about samples - data potentially available in supplementary table]
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed. [Only 2 indoor commercial samples - details unknown.]
Overall Quality Determination			Low	

Study Citation:	Diamond Shamrock Corp. (1983). Summary of the chlorinated hydrocarbon sampling program.			
HERO ID:	1441902			
Conditions of Use:	Manufacture-chloromethane			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation			
Personal sampling data:	"Average: 1.4 ppm High/Low: 8.7ppm / 0 ppm"			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	Low	Sampling/analytical methodology is not specified.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	Medium	Data are for chloromethane manufacture, which is similar to the in-scope occupational scenario DCE manufacture	
	Metric 4: Temporal Representativeness	Low	Monitoring data are greater than 20 years old.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Sample type provided but no other metadata.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination		Low		

Study Citation:	Dow Chemical, (2026). Dow Chemical Company comments on 1,2-dichloroethane regarding inhalation monitoring data.				
HERO ID:	13245903				
Conditions of Use:	Processing as a reactant				
EXTRACTION					
Parameter	Data				
Worker activity description:	Connecting and disconnecting EDC totes to process equipment.				
Exposure route:	Inhalation and dermal exposure.				
Physical form:	Liquid				
Personal sampling data:	5 discrete samples presented ranging from <0.33-5.58 ppm.				
Exposure duration:	20 mins (every 2-6 weeks for tote changeout)				
Exposure frequency:	9-26 days/yr (based on an occurrence of once every 2-6 weeks.				
Number of workers:	14 workers at one site and 25 workers at the second site.				
Personal protective equipment:	Full face respirators, chemical resistant gloves and suit.				
Engineering control:	closed process.				
Comments:	Unclear if samples are PBZ or area, extracted as PBZ. No dermal data in source.				
EVALUATION					
Domain	Metric	Rating	Comments		
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	Low	Sampling/analytical methodology is not specified.		
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.		
	Metric 3: Applicability	High	Data are for processing as a reactant, an in-scope occupational scenario.		
	Metric 4: Temporal Representativeness	High	Monitoring data are no more than 10 years old (2019).		
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).		
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All metadata provided.		
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by samples taken at multiple plants, but uncertainty is not addressed.		
Overall Quality Determination		High			

Study Citation:	Dow Chemical, (1983). Chemical exposure evaluation: Trichloroethylene production plant (sanitized).			
HERO ID:	4214220			
Conditions of Use:	Intermediate in all other basic organic chemical manufacturing			
EXTRACTION				
Parameter	Data			
Worker activity description:	Warehouse Loading Operator, Engineer, Secretary, Unit Supervisor, Lab Technicians, Control A Operators, Class II Operator, Class C Operators, Lab Supervisor, Shift Foreman, Production Foreman, Assistant Superintendent (pg. 9-10)			
Exposure route:	Inhalation			
Physical form:	Vapor			
Personal sampling data:	<0.1-0.2 (pg. 12-31)			
Exposure duration:	8-hr TWA			
Number of workers:	(pg. 9-10)			
Comments:	Measurement type: 8-hr TWA; STEL. Analytic method: charcoal tube sampling/GC (pg. 3).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Sampling/analytical methodology is not an approved OSHA/NIOSH method but is an acceptable methodology.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for processing as an intermediate, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Monitoring data are greater than 20 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sample type and exposure type provided but missing engineering controls and PPE.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	Dow Chemical, (1992). Letter from Dow Chem Co submitting several studies with trichloroethylene and other chemicals in humans with attachments (sanitized).			
HERO ID:	4214362			
Conditions of Use:	Intermediate in all other basic organic chemical manufacturing			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation			
Personal sampling data:	Trichloroethylene and Anhydrous Hydrochloric Acid plants - Eight-hour time-weighted average exposures for ethylene dichloride were ""well below the recommended exposure guidelines"" (p. 15). Chlorinated Ethane Products area - Eight-hour time-weighted average exposures for ethylene dichloride were ""well below the recommended exposure guidelines"" (p. 19). Unit I (Vinyl Chloride Monomer Plant) - Process Technicians in the direct chlorination and repair areas exceeded the STEL for ethylene dichloride.(p. 23)			
Number of workers:	38 Participates			
Personal protective equipment:	Full face air purifying respirators with organic vapor""/acid gas cartridges (OVAG) were used during the opening of the MEHQ additive pot and half face air purifying respirators with OVAG cartridges were used during vinylidene chloride drumming. After the monitoring data was received, the use of full face airline respirators was implemented for vinylidene chloride drumming.(p. 19-20) 'Employees wear full face airline respirators whenever there is a significant potential for exposure. (p. 23)			
Engineering control:	Several engineering steps such as sound insulation on the belts of some of the large motors have been instituted to decrease noise levels in the block.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling/analytical methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Medium	Applicable to manufacturing or processing, both in scope occupational scenarios, but actual process unclear
	Metric 4:	Temporal Representativeness	Low	Monitoring data are greater than 20 years old (early 1990s)
	Metric 5:	Sample Size	N/A	No quantified/quantifiable (i.e., graph) data provided
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Uninformative	No monitoring data provided - only indicates levels are below recommended exposure limits, which are not stated.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Uninformative		

Study Citation:	Dow Chemical, (1990). Occupational health summary report location: ethylene dichloride/npa.			
HERO ID:	6569975			
Conditions of Use:	Processing as a reactant			
EXTRACTION				
Parameter	Data			
Worker activity description:	Control operator			
Area sampling data:	8-hr TWA: 1.3 ppm; short-term: 5 ppm			
Personal protective equipment:	Respirator			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling/analytical methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for processing as a reactant, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Monitoring data are greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (mean, max) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sample type and exposure type provided but missing engineering controls, exposure duration, exposure frequency.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by taking both TWA and short-term samples, but uncertainty is not addressed.
Overall Quality Determination		Medium		

Study Citation:	ECHA, (2021). Registration dossier: 1,2-dichloroethane: Toxicological summary.			
HERO ID:	7325690			
Conditions of Use:	Specific condition of use not considered, this document assess health impacts to general exposure 1.2-dichloroethane. t			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation and dermal			
Physical form:	vapor and liquid			
Dermal exposure data:	The most relevant experimental design for the human dermal exposure scenario has been the unoccluded application of 5 or 10 μl of 1,2-dichloroethane/cm² (corresponding to 6.2 and 12.4 mg/cm², respectively) to human skin disks for up to 8 hours, resulting in an absorption rate of 92 or 82 μg/cm²/hr, respectively. Absorption had virtually ceased by 0.25 hours which is due to the volatility of 1,2-dichloroethane resulting in a rapid evaporation of the substance following dermal exposure. Based on this data, the penetration of 92 μg/cm² after dermal exposure to 6.2 mg/cm² is taken as a realistic worst case for dermal absorption. This corresponds to the absorption of 1.5 % of the applied dose. The dermal DMEL is 3953/(25000) = 0.156 mg/kg bw/d for the 10-5 risk (the allometric scaling factor was implicitly taken into account). Considering a risk of 4*10-3, the dermal DMEL is 62.4 mg/kg bw/d.			
Exposure duration:	8 hours per day			
Exposure frequency:	5 days per week 48 weeks per year			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	European Chemicals Association
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	European - OECD members
	Metric 3:	Applicability	Medium	Considered inhalation and dermal exposure -regardless of source of 1,2-dichloroethane
	Metric 4:	Temporal Representativeness	Medium	Data from 2006 studies. More than 10 years.
	Metric 5:	Sample Size	Medium	for dermal exposure results from study and associated calculations provided
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include exposure type, amount exposed, and absorption rate but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	data for two different dermal exposure scenarios are provided to evaluate variance between these conditions. Uncertainty not discussed.
Overall Quality Determination		Medium		

Study Citation:	ENSR, (1991). Acute ISC input data-full grid & AB 2588 health risk assessments: Corrected & alternative emissions cases for the Cymric area oil fields McKittrick, California with letter 090591.			
HERO ID:	1481763			
Conditions of Use:	Petrochemical Manufacturing			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation			
Area sampling data:	1.929*10^-5 - 2.491*10^-4 (ug/m^3) (Pg. 2202, 2303)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for petrochemical production, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	Envirologic Data, (1992). Assessment of risks from potential exposure to airbourne facility emissions under California AB 2588 for the Rohr Inc Facility Riverside, Calif (vol. 1) (final report) w-letter.			
HERO ID:	4214360			
Conditions of Use:	Processing as an intermediate			
EXTRACTION				
Parameter	Data			
Number of sites:	1			
Exposure route:	Inhalation (Pg. 53)			
Area sampling data:	Modeled maximum: 0.09146 (ug/m^3) (Pg. 63)			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for processing as an intermediate, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is described qualitatively.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Uncertainty is addressed by model parameters being discussed. Variability is not addressed.
Overall Quality Determination		Medium		

Study Citation:	Ethyl Corporation, (1981). Industrial hygiene survey Saytech Chemicals: Date of survey: February 23-26, 1981.			
HERO ID:	1579735			
Conditions of Use:	Unknown			
EXTRACTION				
Parameter	Data			
Worker activity description:	Operators (pg. 14 for details)			
Exposure route:	inhalation			
Personal sampling data:	22; 5.9; 10; 5.8; 5.4; 22; 8.5 (ppm) (pg. 14)			
Exposure duration:	pg. 14 (gives exact times sampling occurred, ~6-7 hours for each sample)			
Comments:	Number of samples: 7. Type of sampling: Unclear, looks to be both area and personal (pg. 14). Sampling location: Centrifuge; Reactor Area (10’ from 102 reactor) (pg14). Duration: pg. 14 (gives exact times sampling occurred, ~6-7 hours for each sample)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling/analytical methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Medium	Data are for an unknown occupational scenario which may be similar to an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Monitoring data are greater than 20 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sample type and exposure type provided but missing number of workers, PPE, engineering controls, analytical method.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	Ferro, (1981). Worker exposure and air sampling results - Ethylene dichloride and phenol - With cover letter dated 073187.			
HERO ID:	5447343			
Conditions of Use:	Processing as an intermediate			
EXTRACTION				
Parameter	Data			
Number of sites:	1			
Area sampling data:	<0.2 (ppm) (Pg. 7)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Sampling or analytical methodology is not equivalent to an approved OSHA or NIOSH method and EPA review of information indicates the methodology is acceptable. Differences in methods are not expected to lead to lower quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Data over 20 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Monitoring data include sample type (e.g., personal breathing zone) but no other meta-data.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Ghose, M. K. (1991). Evaluation of air pollution due to fugitive emissions. Indian Journal of Environmental Health 33(1):66-69.			
HERO ID:	5453897			
Conditions of Use:	Solvent			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation			
Physical form:	vapor			
Area sampling data:	Sample A6 (Impregnation room): 1.32 mg/nm^3, Sample A7 (Wax melting area): 0.76 mg/nm^3, Sample A8 (Near jumbo extrude): 0.46 mg/nm^3			
Exposure duration:	8 hr TWA			
Engineering control:	exhaust fans, cross fans, ducting arrangements.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	Medium	Sampling/analytical methodology is not an approved OSHA/NIOSH method but is an acceptable methodology.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data are from India, a non-OECD country.	
	Metric 3: Applicability	High	Data are for solvents, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Monitoring data are greater than 20 years old.	
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Sample type and exposure type provided but missing some other metadata.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination		Low		

Study Citation:	Grasso, P., Sharratt, M., Davies, D. M., Irvine, D. (1984). Neurophysiological and psychological disorders and occupational exposure to organic solvents. Food and Chemical Toxicology 22(10):819-852.			
HERO ID:	66439			
Conditions of Use:	Processing as a reactant			
EXTRACTION				
Parameter	Data			
Worker activity description:	Polish refinery			
Area sampling data:	ceiling: 200 (ppm) (Pg. 13)			
Exposure frequency:	6 months			
Number of workers:	42			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Poland, an OECD country.
	Metric 3:	Applicability	High	Data are for processing as a reactant, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	Hanazato, M., Suzuki, N., Koga, C., Nakaoka, H., Mori, C. (2018). A study of design for reduction and monitoring of volatile organic compounds in indoor air: The case of a commercial bank in Japan. Journal of Asian Architecture and Building Engineering 17(3):573-579.			
HERO ID:	5344296			
Conditions of Use:	General occupational indoor environments			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation			
Area sampling data:	ND (LOD = 1 ug/m^3)			
Exposure duration:	1 hr. sampling (p. 4)			
Comments:	Measurements were performed using the standard methods of air sampling and measurement issued by the MHLW (MHLW, 2016b).			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Sampling/analytical methodology is not an approved OSHA/NIOSH method but is an acceptable methodology. [Journal article]
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Japan, an OECD country.
	Metric 3:	Applicability	Low	Data are for indoor air concentrations at a bank, which is similar to other indoor in-scope occupational scenarios. [General indoor air concentrations at a bank - not a listed COU]
	Metric 4:	Temporal Representativeness	High	Monitoring data are no more than 10 years old. [2018]
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics. [2 samples taken - ND values for both]
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sample type and exposure type provided but missing metadata other than duration. [Area samples - no specific metadata provided except for sample duration]
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by taking samples during different years, but uncertainty is not addressed. [Samples taken in Dec 2013 and Feb 2014 but only at one site]
Overall Quality Determination		Medium		

Study Citation:	Harkov, R., Gianti, S. J., Bozzelli, J. W., Laregina, J. E. (1985). Monitoring volatile organic compounds at hazardous and sanitary landfills in New Jersey. Journal of Environmental Science and Health, Part A: Environmental Science and Engineering 20(5):491-502.			
HERO ID:	5245498			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation			
Physical form:	Vapor			
Area sampling data:	PDF page 7 has arithmetic mean area sampling data for 6 abandoned haz waste sites and one sanitary landfill in NJ, and reports the max concentration across all sites. Pg 8 has ambient monitoring data for Newark, NJ			
Comments:	pg 6 for No. duplicates for area sampling at sites. 26 samples for ambient monitoring. 72 hour samples			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Sampling/analytical methodology is not an approved OSHA/NIOSH method but is an acceptable methodology.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Monitoring data are greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (mean, max) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sample type and exposure type provided but missing most other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by sampling at multiple sites, but uncertainty is not addressed.
Overall Quality Determination		Medium		

Study Citation:	Heavner, D. L., Morgan, W. T., Ogden, M. W. (1996). Determination of volatile organic compounds and respirable suspended particulate matter in New Jersey and Pennsylvania homes and workplaces. Environment International 22(2):159-183.			
HERO ID:	5544873			
Conditions of Use:	Unknown			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation			
Physical form:	Vapor			
Area sampling data:	Nonsmoking work: range 0-1.32 ug/m3, mean 0.09 ug/m3, SD 0.24 ug/m3, n=51; Smoking work: range 0-0.23 ug/m3, mean 0.03 ug/m3, SD 0.06 ug/m3, n=29; Nonsmoking home: range 0-0.54 ug/m3, mean 0.03ug/m3, SD 0.09 ug/m3, n=61; Smoking home: range 0-9.72 ug/m3, mean 0.32 ug/m3, SD 1.72 ug/m3, n=32			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Sampling/analytical methodology is not an approved OSHA/NIOSH method but is an acceptable methodology.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Low	Data are for smoking vs. nonsmoking homes and workplaces which is similar to an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Monitoring data are greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (median, maximum, minimum, mean, standard deviation) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sample type and exposure type provided but missing most other metadata (data is not industry specific).
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by comparing data between smoking and non-smoking homes and workplaces, but uncertainty is not addressed.
Overall Quality Determination		Medium		

Study Citation:	Hogstedt, C., Rohlén, O., Berndtsson, B. S., Axelson, O., Ehrenberg, L. (1979). A cohort study of mortality and cancer incidence in ethylene oxide production workers. Occupational and Environmental Medicine 36(4):276-280.			
HERO ID:	18418			
Conditions of Use:	Manufacturing (Byproduct)			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation			
Physical form:	vapor			
Area sampling data:	chlorohydrintowers during ethylene oxide production:100 (mg/m3) (estimated not measured;Pg. 3)			
Comments:	Monitoring is estimated from production data, not measured.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Methodology for estimating air concentration from production data is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from the United Kingdom, an OECD country.
	Metric 3:	Applicability	Medium	The data are for an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, in terms of the type of industry, operations, and work activities.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Monitoring data include sample type (e.g., personal breathing zone) but no other meta-data.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.
Overall Quality Determination		Low		

Study Citation:	Hsieh, H. I., Wang, J. D., Chen, P. C., Cheng, T. J. (2003). Synergistic effect of hepatitis virus infection and occupational exposures to vinyl chloride monomer and ethylene dichloride on serum aminotransferase activity. Occupational and Environmental Medicine 60(10):774-778.			
HERO ID:	200380			
Conditions of Use:	Processing as a reactant			
EXTRACTION				
Parameter	Data			
Number of sites:	9			
Personal sampling data:	0.35 (ppm) (Pg. 2)			
Number of workers:	568			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data are from Taiwan, a non-OECD country.
	Metric 3:	Applicability	High	Data are for processing as a reactant, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Low	

Study Citation:	IARC, (1999). Re-evaluation of some organic chemicals, hydrazine, and hydrogen peroxide.			
HERO ID:	201838			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Number of sites:	3			
Exposure route:	inhalation			
Area sampling data:	Mean concentrations of 1,2-dichloroethane at three production plants in the United Kingdom in 1990 were 2.8, 3.2 and 6.8 mg/m3; 95% of samples contained less than 20 mg/m3, while maximum values at the plants were 18, 80 and 160 mg/m3 (United Kingdom Health and Safety Executive, 1992). pg. 509			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling/analytical methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from UK, an OECD country.
	Metric 3:	Applicability	High	Data are for manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Monitoring data are greater than 20 years old. [1999]
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (average, 95th percentile, maximum) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Sample type provided but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Low		

Study Citation:	Jacobs, E. S. (1980). Use and Air Quality Impact of Ethylene Dichloride and Ethylene Dibromide Scavengers in Leaded Gasoline. Banbury Report, vol. 5 :239-255.		
HERO ID:	2743177		
Conditions of Use:	Fuels and related products		
EXTRACTION			
Parameter	Data		
Personal sampling data:	Tank Sampler: 0.001 - 2.2 ppm (0.5); Blender operator: 0.003 - 0.018 ppm (median 0.023).		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	Medium	Sampling or analytical methodology is not equivalent to an approved OSHA or NIOSH method and EPA review of information indicates the methodology is acceptable. Differences in methods are not expected to lead to lower quality data.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3: Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	Data is more than 20 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (range, median) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	Uncertainty is addressed by sampling methods. Variability addressed by considering different worker activities.
Overall Quality Determination		High	

Study Citation:	James, J. T. (1997). Carcinogens in spacecraft air. Radiation Research 148(5 Supplement):S11-S16.		
HERO ID:	4075441		
Conditions of Use:	Spacecraft Air - Not in scope		
EXTRACTION			
Parameter	Data		
Worker activity description:	Space craft ambient air		
Exposure route:	Inhalation		
Area sampling data:	0.06 (mg/m^3) (Pg. 4)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	Medium	Sampling or analytical methodology is not equivalent to an approved OSHA or NIOSH method and EPA review of information indicates the methodology is acceptable.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States.
	Metric 3: Applicability	Uninformative	The data are from an occupational or non-occupationalscenario that does not apply to any occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	The data were collected before the most recent PEL establishment or update or are more than 20 years old if no PEL is established.
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Monitoring data include most critical metadata, such as sample type and exposure type, but lacks additional metadata, such as sample durations, exposure durations, exposure frequency, and/orworker activities.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.
Overall Quality Determination		Uninformative	

Study Citation:	Jones, R. M., Dell, L., Torres, C., Simmons, C. E., Poole, J., Boelter, F. W., Harper, P. (2015). Exposure Reconstruction and Risk Analysis for Six Semiconductor Workers With Lymphohematopoietic Cancers. Journal of Occupational and Environmental Medicine 57(6):649-658.			
HERO ID:	3420798			
Conditions of Use:	Semiconductor manufacture			
EXTRACTION				
Parameter	Data			
Worker activity description:	Process byproduct			
Personal sampling data:	ND (Pg. 651)			
Exposure duration:	For normal operations, we used shift duration or multishift (adjusted to an 8-hour time-weighted average [TWA]) exposure measurements in the exposure reconstruction. For maintenance operations, we separately considered task duration and shift-duration exposure measurements.			
Number of workers:	6			
Comments:	The specific facilities characterized were two semiconductor wafer fabrication lines located in Giheung and one wafer test and packaging facility in Onyang.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Sampling or analytical methodology is not equivalent to an approved OSHA or NIOSH method and EPA review of information indicates the methodology is acceptable.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	Medium	The data are for an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, in terms of the type of industry, operations, and work activities.
	Metric 4:	Temporal Representativeness	High	The operations, equipment, and worker activities associated with the data are expected to be representative of current operations, equipment, and activities.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include most critical metadata, such as sample type and exposure type, but lacks additional metadata, such as sample durations, exposure durations, exposure frequency, and/orworker activities.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The monitoring study provides only limited discussion of the variability in the determinants of exposure for the sampled site or sector. The monitoring study provides only limited discussion of the uncertainty in the exposure estimates.
Overall Quality Determination		Medium		

Study Citation:	Kozik, I. V. (1957). [Problems of occupational hygiene in the use of dichloroethane in the aviation industry]. Gigiena Truda i Professional'nye Zabolevaniya 1:31-38.			
HERO ID:	18135			
Conditions of Use:	Adhesives and sealants			
EXTRACTION				
Parameter	Data			
Worker activity description:	gluers, preparation of tanks and different rubber articles. Insignificant number of workers dismantling metal molds, washing tanks, etc. (pg 2)			
Exposure route:	inhalation			
Physical form:	vapor			
Area sampling data:	50 mg/m3 during 70-75% of shift, 80-150 mg/m3 for remainder of shift (pg 1); 80-158 mg/m3 occurred when sheets were coated with glue and lasted only 5-6 min, decreased to 62-82 mg/m3 once glue dried, and at end of drying period 15 min later they decreased to 30-40 mg/m3 (pg 2); at 31C, concentration was 145 mg/m3, 94 mg/m3 at 27C and 80 mg/m3 at 25C (pg 3);At the coating table: 110 mg/m3, 50 cm from the table: 94 mg/m3, 1 m from the table: 54 mg/m3, 2.5 m from the table: 37 mg/m3, 1 m from the floor: 160 mg/m3, 2 m from the floor: 24 mg/m3, 3 m from the floor: 6 mg/m3			
Personal protective equipment:	respirators with active air input (pg 10)			
Engineering control:	exhaust system (pg 4) - recommendations on pg 10			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	Low	Sampling/analytical methodology is not specified.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data are from Russia, a non-OECD country.	
	Metric 3: Applicability	High	Data are for adhesives and sealants, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Monitoring data are greater than 20 years old.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Sample type provided but no other metadata.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by taking samples at various areas within the plant and different temperatures, but uncertainty is not addressed.	
Overall Quality Determination		Low		

Study Citation:	Lehtinen, J., Veijanen, A. (2011). Determination of odorous VOCs and the risk of occupational exposure to airborne compounds at the waste water treatment plants. Water Science and Technology 63(10):2183-2192.			
HERO ID:	1457269			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Worker activity description:	Trash rake, sand separation, sludge dewatering			
Exposure route:	inhalation			
Area sampling data:	153.7 - 517 (ug/m^3) (Pg. 4)			
Comments:	Analyzed via Tenax GR adsorption resin and air pump.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	High	Sampling/analytical methodology is equivalent to an approved OSHA/NIOSH method.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Finland, an OECD country.	
	Metric 3: Applicability	High	Data are for disposal, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	High	Monitoring data are no more than 10 years old.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Sample type and exposure type provided but missing exposure duration, exposure frequency, engineering controls, PPE.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by sampling at 3 different locations but uncertainty is not addressed.	
Overall Quality Determination		High		

Study Citation:	Li, K. M., Cheng, W. T. (1991). The occupational exposure level of 1, 2-dichloroethane in an EM preparation laboratory. Journal of the Royal Society of Health 111(5):169.			
HERO ID:	5552604			
Conditions of Use:	Laboratory chemical			
EXTRACTION				
Parameter	Data			
Worker activity description:	Preparation room			
Personal sampling data:	PBZ: 13.06 (ppm) (Pg. 1)			
Area sampling data:	Area: 8.67 (ppm); 8-hr TWA: 4.9 (ppm)			
Exposure duration:	3 hours			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	High	Sampling or analytical methodology is an approved OSHA or NIOSH method or is well described and found to be equivalent to approved OSHA or NIOSH methods.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	The data are from a non-OECD country.	
	Metric 3: Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Low	Data from more than 20 years old.	
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Monitoring data include sample type (e.g., personal breathing zone) but no other meta-data.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.	
Overall Quality Determination		Low		

Study Citation:	Loizidou, M., Kapetanios, E. G. (1992). Study on the gaseous emissions from a landfill. Science of the Total Environment 127(3):201-210.			
HERO ID:	1671226			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Worker activity description:	landfill			
Exposure route:	inhalation			
Area sampling data:	0.5-14.0 (ug/m^3) (Pg. 8)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Sampling or analytical methodology is not equivalent to an approved OSHA or NIOSH method and EPA review of information indicates the methodology is acceptable.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Greece, an OECD country.
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The data is more than 20 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include most critical metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by multiple sampling events at multiple sites but uncertainty is not addressed.
Overall Quality Determination		Medium		

Study Citation:	Maidment, S. C. (1998). Occupational hygiene considerations in the development of a structured approach to select chemical control strategies. Annals of Occupational Hygiene 42(6):391-400.			
HERO ID:	1023667			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter		Data		
Area sampling data:		Mean exposures from 3 plants- Plant 1: 0.7, Plant 2: 0.8, Plant 3: 1.7 (ppm). Range from 0-40 ppm 95% of results <5 ppm (Pg. 7)		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Report uses high quality data that are from the Criteria Documents for Occupational Exposure Limits published by Health and Safety Executive (HSE), a UK government agency. However, methodology used for monitoring data is not specified in report.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	UK is an OECD country
	Metric 3:	Applicability	Medium	The data are for an occupational scenario assumed to be within the scope of the risk evaluation(limited information is provided on the exposure scenario related to measurements).
	Metric 4:	Temporal Representativeness	Low	More than 20 years old and may have outdated operations, equipment, and activities
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Monitoring data include sample type (e.g., personal breathing zone) but no other meta-data.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The study discusses variability in chemical exposure and uncertainty with their results and their use of peer review and comparison with different measured values across different plants.
Overall Quality Determination			Medium	

Study Citation:	Mcmanus, K. P. (1992). Health Hazard Evaluation Report HETA 91-251-2218, New Hampshire Ball Bearing, Laconia, New Hampshire. 4(HETA-91-251-2218):91-251.
HERO ID:	2780125
Conditions of Use:	Adhesives and sealants

EXTRACTION	
Parameter	Data
Worker activity description:	Two employees perform cloth preparation by rolling fabric with adhesives and setting them to dry. Usually one employee works in the oven room spraying bushings with a lubricant and drying them in the oven. Twelve employees glue strips of Teflon cloth to the bushing in the Teflon room.
Exposure route:	inhalation
Physical form:	vapor
Personal sampling data:	Vydx Hood 0.3 ppmDipping 0.1 ppmDipping 0.1 ppmVydx 0.3 ppm
Area sampling data:	Oven Room 0.1 ppmVydx Ovens 0.1 ppmFreekote 1.3 ppm
Exposure duration:	up to 10 hours per day
Exposure frequency:	2 shifts daily (7 AM to Midnight) 40 hours per week
Number of workers:	40in the teflon room /490 total workers
Personal protective equipment:	respirators

EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	High	NIOSH Study
Domain 2: Representativeness	Metric 2: Geographic Scope	High	US
	Metric 3: Applicability	High	The data are for an occupational scenario (Coating operations) within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	Prior to latest PEL and more than 20 years old
	Metric 5: Sample Size	High	Results from individual sampling events were provided which could be used to develop statistics. Uncertainty was not discussed but assumed that it was addressed in the NIOSH method used.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Monitoring data include all associated metadata, including sample types, exposure types, sample durations, exposure durations worker activities, and exposure frequency.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	Results from individual sampling events were provided which could be used to evaluate variability between locations and jobs. As this is a NIOSH study, it is assumed that uncertainty was considered in the Methods.

Overall Quality Determination

High

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Study Citation:	Mcmanus, K. P. (1992). Health Hazard Evaluation Report HETA 91-251-2218, New Hampshire Ball Bearing, Laconia, New Hampshire. 4(HETA-91-251-2218):91-251.		
HERO ID:	2780125		
Conditions of Use:	Adhesives and sealants		
		EVALUATION	
Domain	Metric	Rating	Comments

Study Citation:	Mo, Z., Shao, M.,in, Lu, S., Qu, H., Zhou, M., Sun, J.,in, Gou, B.,in (2015). Process-specific emission characteristics of volatile organic compounds (VOCs) from petrochemical facilities in the Yangtze River Delta, China. Science of the Total Environment 533:422-431.			
HERO ID:	3075174			
Conditions of Use:	Petrochemical manufacturing			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation			
Area sampling data:	Total VOC concentrations ranged from 32-2,794 ug/m3			
Comments:	Measurement type: 3.2-L fused silica stainless steel canisters. Analytic method: U.S. EPA methods TO-14 and TO-15.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is an approved EPA method.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data are from China, a non-OECD country.
	Metric 3:	Applicability	Low	Data are for general petrochemical ambient air, which is similar to the in-scope occupational scenario plastic and rubber products. Also, data is not specific to any chemical.
	Metric 4:	Temporal Representativeness	High	Monitoring data are no more than 10 years old.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics. [Samples were individually taken at different areas in the plants (1 value reported per area)]
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Sample type provided but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by taking samples at different plant locations, but uncertainty is not addressed. [Variability in different plant locations, but not for specific process areas or at different sites]
Overall Quality Determination			Low	

Study Citation:	NIOSH, (1976). Criteria for a recommended standard: Occupational exposure to ethylene dichloride (1,2-dichloroethane).				
HERO ID:	412734				
Conditions of Use:	Processing				
EXTRACTION					
Parameter	Data				
Exposure route:	inhalation, ingestion, and dermal				
Physical form:	vapor and liquid				
Personal sampling data:	Adrenalin manufacture (Russia) 1971suction transfer from a carboy into the extractor 5.6-22.5 ppm				
Personal protective equipment:	Respiratory protection- during installation and testing of engineering controls - nonroutine operations- emergenciesRespirators need to meet requirements 28 CFR 1910.134 and 30CFR 11.2-1Protective clothing (hat, long-sleeved shirts, and pants)gogglesgloves, boots, aprons Self-contained breathing apparatusair supply suites				
Engineering control:	storage locations should be diked to contain spills				
EVALUATION					
Domain	Metric	Rating	Comments		
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling or analytical methodology is not specified.	
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Russia - non OECD member	
	Metric 3:	Applicability	High	The data are for an occupational scenario (manufacture of epinephrine) within the scope of the risk evaluation.	
	Metric 4:	Temporal Representativeness	Low	more than 20 years old	
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Monitoring data include sample type (breathing Zone) but no other metadata.	
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.	
Overall Quality Determination			Low		

Study Citation:	NIOSH, (1976). Criteria for a recommended standard: Occupational exposure to ethylene dichloride (1,2-dichloroethane).				
HERO ID:	412734				
Conditions of Use:	Plastics and Rubber Products; Products such as plastics and rubber products				
EXTRACTION					
Parameter	Data				
Exposure route:	inhalation, ingestion, and dermal				
Physical form:	vapor and liquid				
Area sampling data:	Aircraft workers - soft fuel tank installation (Russia) 1957Gluing 5-40 ppm (initially) as the glue dried the values decreased from 22-40(5-6 minutes to 17-22 to 7.5-10 (15 min)Rubber cementing (US) 3 plants 85-110 ppm average 140-200 ppm Max				
Exposure duration:	up to 10 hr day				
Exposure frequency:	40 hrs per week				
Personal protective equipment:	Respiratory protection- during installation and testing of engineering controls - nonroutine operations- emergenciesRespirators need to meet requirements 28 CFR 1910.134 and 30CFR 11.2-1Protective clothing (hat, long-sleeved shirts, and pants)gogglesgloves, boots, aprons Self-contained breathing apparatusair supply suites				
Engineering control:	storage locations should be diked to contain spills				
EVALUATION					
Domain	Metric	Rating	Comments		
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling or analytical methodology is not specified.	
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US but also includes data from Russia	
	Metric 3:	Applicability	High	The data are for an occupational scenario (gluing of rubber products) within the scope of the risk evaluation.	
	Metric 4:	Temporal Representativeness	Low	More than 20 years old	
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Monitoring data include sample type (e.g., personal breathing zone) but no other meta-data.	
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.	
Overall Quality Determination			Low		

Study Citation:	NIOSH, (1976). Criteria for a recommended standard: Occupational exposure to ethylene dichloride (1,2-dichloroethane).			
HERO ID:	412734			
Conditions of Use:	Other Uses: leather and Textiles			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation, ingestion, and dermal			
Physical form:	vapor and liquid			
Area sampling data:	Leather finishing (US) 65 ppm average 95 ppm maxFabric spreading (US) 125 ppm average 210 ppm max			
Exposure duration:	up to 10 hr day			
Exposure frequency:	40 hrs per week			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling or analytical methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US
	Metric 3:	Applicability	High	The data are for an occupational scenario (Leather and Textiles) within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	More than 20 years old
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Monitoring data include sample type (e.g., personal breathing zone) but no other meta-data.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.
Overall Quality Determination			Low	

Study Citation:	NIOSH, (1976). Criteria for a recommended standard: Occupational exposure to ethylene dichloride (1,2-dichloroethane).				
HERO ID:	412734				
Conditions of Use:	Other Uses: Chemical storage				
EXTRACTION					
Parameter	Data				
Exposure route:	inhalation, ingestion, and dermal				
Physical form:	vapor and liquid				
Area sampling data:	Drum filling (US) 35 ppm average 45 ppm max				
Exposure duration:	up to 10 hr day				
Exposure frequency:	40 hrs per week				
Personal protective equipment:	Respiratory protection- during installation and testing of engineering controls - nonroutine operations- emergenciesRespirators need to meet requirements 28 CFR 1910.134 and 30CFR 11.2-1Protective clothing (hat, long-sleeved shirts, and pants)gogglesgloves, boots, aprons Self-contained breathing apparatusair supply suites				
Engineering control:	storage locations should be diked to contain spills				
EVALUATION					
Domain	Metric	Rating	Comments		
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling or analytical methodology is not specified.	
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US	
	Metric 3:	Applicability	High	The data are for an occupational scenario (chemical storage) within the scope of the risk evaluation.	
	Metric 4:	Temporal Representativeness	Low	More than 20 years old	
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Monitoring data include sample type (e.g., personal breathing zone) but no other meta-data.	
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.	
Overall Quality Determination			Low		

Study Citation:	NIOSH, (1976). Criteria for a recommended standard: Occupational exposure to ethylene dichloride (1,2-dichloroethane).			
HERO ID:	412734			
Conditions of Use:	Solvents; A component of degreasing and cleaning			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation, ingestion, and dermal			
Physical form:	vapor and liquid			
Area sampling data:	Metal cleaning (US) 180 ppm average 250 ppm max			
Exposure duration:	up to 10 hr day			
Exposure frequency:	40 hrs per week			
Personal protective equipment:	Respiratory protection- during installation and testing of engineering controls - nonroutine operations- emergenciesRespirators need to meet requirements 28 CFR 1910.134 and 30CFR 11.2-1Protective clothing (hat, long-sleeved shirts, and pants)gogglesgloves, boots, aprons Self-contained breathing apparatusair supply suites			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling or analytical methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US
	Metric 3:	Applicability	High	The data are for an occupational scenario (metal cleaning) within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	More than 20 years old
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Monitoring data include sample type (e.g., personal breathing zone) but no other meta-data.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.
Overall Quality Determination			Low	

Study Citation:	NIOSH, (1976). Criteria for a recommended standard: Occupational exposure to ethylene dichloride (1,2-dichloroethane).				
HERO ID:	412734				
Conditions of Use:	Solvents; a component of degreasing and cleaning solvents				
EXTRACTION					
Parameter	Data				
Exposure route:	inhalation, ingestion, and dermal				
Physical form:	vapor and liquid				
Area sampling data:	Oil Refinery (Poland) 1959Centrifuge room 64 ppm 62 ppm 200 ppm Pump room 1 16 ppm 10 ppm 17 ppmPump room 2 25 ppm 13 ppmCrystallization room 30 ppm 37 ppm				
Personal protective equipment:	Respiratory protection- during installation and testing of engineering controls - nonroutine operations- emergenciesRespirators need to meet requirements 28 CFR 1910.134 and 30CFR 11.2-1Protective clothing (hat, long-sleeved shirts, and pants)gogglesgloves, boots, aprons Self-contained breathing apparatusair supply suites				
EVALUATION					
Domain	Metric	Rating			Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling or analytical methodology is not specified.	
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Poland	
	Metric 3:	Applicability	High	The data are for an occupational scenario (Refinery) within the scope of the risk evaluation.	
	Metric 4:	Temporal Representativeness	Low	More than 20 years old	
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Monitoring data include sample type (area) but no other metadata.	
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.	
Overall Quality Determination			Low		

Study Citation:	NIOSH, (1976). Criteria for a recommended standard: Occupational exposure to ethylene dichloride (1,2-dichloroethane).			
HERO ID:	412734			
Conditions of Use:	Other uses - fumigant			
EXTRACTION				
Parameter	Data			
Worker activity description:	pesticide application			
Exposure route:	inhalation, ingestion, and dermal			
Physical form:	vapor and liquid			
Personal sampling data:	Potato field fumigation (Poland) 1954 4 ppm			
Area sampling data:	Agricultural workers -fumigant (Polland) 1954 14.5 -15 ppm			
Exposure duration:	up to 10 hr day			
Exposure frequency:	40 hrs per week			
Personal protective equipment:	Respiratory protection- during installation and testing of engineering controls - nonroutine operations- emergenciesRespirators need to meet requirements 28 CFR 1910.134 and 30CFR 11.2-1Protective clothing (hat, long-sleeved shirts, and pants)gogglesgloves, boots, aprons Self-contained breathing apparatusair supply suites			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling or analytical methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Poland
	Metric 3:	Applicability	High	The data are for an occupational scenario (agricultural) within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	More than 20 years old
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Monitoring data include sample type (e.g., personal breathing zone) but no other meta-data.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.
Overall Quality Determination			Low	

Study Citation:	NIOSH, (1976). Criteria for a recommended standard: Occupational exposure to ethylene dichloride (1,2-dichloroethane).				
HERO ID:	412734				
Conditions of Use:	Other Uses: leather and Textiles				
EXTRACTION					
Parameter	Data				
Exposure route:	inhalation, ingestion, and dermal				
Physical form:	vapor and liquid				
Area sampling data:	Drum filling (US) 35 ppm average 45 ppm maxMetal cleaning (US) 180 ppm average 250 ppm max				
Exposure duration:	up to 10 hr day				
Exposure frequency:	40 hrs per week				
Personal protective equipment:	Respiratory protection- during installation and testing of engineering controls - nonroutine operations- emergenciesRespirators need to meet requirements 28 CFR 1910.134 and 30CFR 11.2-1Protective clothing (hat, long-sleeved shirts, and pants)gogglesgloves, boots, aprons Self-contained breathing apparatusair supply suites				
Engineering control:	storage locations should be diked to contain spills				
EVALUATION					
Domain	Metric	Rating	Comments		
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling or analytical methodology is not specified.	
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US	
	Metric 3:	Applicability	High	The data are for an occupational scenario (Leather and Textiles) within the scope of the risk evaluation.	
	Metric 4:	Temporal Representativeness	Low	More than 20 years old	
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Monitoring data include sample type (e.g., personal breathing zone) but no other meta-data.	
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.	
Overall Quality Determination			Low		

Study Citation:	NIOSH, (1976). Criteria for a recommended standard: Occupational exposure to ethylene dichloride (1,2-dichloroethane).			
HERO ID:	412734			
Conditions of Use:	Solvent: a component of degreasing and cleaning solvent			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation, ingestion, and dermal			
Physical form:	vapor and liquid			
Area sampling data:	Wool Scouring (US) 1937 0.4-5 ppm			
Exposure duration:	up to 10 hr day			
Exposure frequency:	40 hrs per week			
Personal protective equipment:	Respiratory protection- during installation and testing of engineering controls - nonroutine operations- emergenciesRespirators need to meet requirements 28 CFR 1910.134 and 30CFR 11.2-1Protective clothing (hat, long-sleeved shirts, and pants)gogglesgloves, boots, aprons Self-contained breathing apparatusair supply suites			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling or analytical methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US
	Metric 3:	Applicability	High	The data are for an occupational scenario (wool cleaning) within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	More than 20 years old
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Monitoring data include sample type (e.g., personal breathing zone) but no other meta-data.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.
Overall Quality Determination		Low		

Study Citation:	NIOSH, (1978). Current intelligence bulletin 27 Chloroethanes: review of toxicity.
HERO ID:	64409
Conditions of Use:	Health effects study - condition of use not specified

EXTRACTION	
Parameter	Data
Worker activity description:	Mechanics, janitors, nursing, machine operators, assemblers, pressmen, plate printers, printing, cooks, gas station attendants, electricians, telephone installers, car washers, secretaries, checkers, examiners and inspectors, manufacturing,
Exposure route:	inhalation
Physical form:	vapor
Number of workers:	1,900,000
Personal protective equipment:	The least preferred method is the use of personal protective equipment. This equipment, which may include respirators, goggles, gloves, etc., should not be used as the only means to prevent or minimize exposure during routine operations.Exposure to chloroethanes should not be controlled with the use of respirators except:— During the time period necessary to install or implement engineering or work practice controls; or— In work situations in which engineering and work practice controls are technically not feasible; or— For maintenance; or — For operations which require entry into tanks or closed vessels; or— In emergencies.Only respirators approved by the National Institute for Occupational Safety and Health (NIOSH; under the provisions of Federal regulations 30 CFR 11 should be used.)
Engineering control:	The most effective control of chloroethanes, where feasible, is at the source of contamination by enclosure of the operation and/or local exhaust ventilation. Guidelines for selected processes and operations can be found in the NIOSH Recommended Industrial Ventilation Guidelines.If feasible, the process or operation should be enclosed with a slight vacuum so that any leakage will result in the flow of external air into the enclosure.The next .nest effective means of control would be a well designed local exhaust ventilation system that physically encloses the process as much as possible, with sufficient capture velocity to keep the contaminant from entering the work atmosphere.

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	NIOSH study.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US
	Metric 3:	Applicability	Medium	Chemical relevant data, but data for a specific occupational scenario is not provided.
	Metric 4:	Temporal Representativeness	Low	1978 - prior to PEL (1979) and more than 20 years old
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include most critical metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.

Overall Quality Determination

Medium

Study Citation:	NTP, (1991). Toxicity studies of 1,2-dichloroethane (ethylene bichloride) (CAS No. 107-06-2) in F344/N rats, Sprague Dawley rats, Osborne-Mendel rats, and B6C3F1 mice (drinking water and gavage studies).			
HERO ID:	1772371			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Worker activity description:	Using 1,2-DCA as a solvent			
Physical form:	Liquid			
Area sampling data:	40 - 800 (mg/m^3) (Pg. 10)			
Number of workers:	80,000 (1989) (Pg. 10)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	Shayakhmetov, S., Zhurba, O., Alekseenko, A., Merinov, A. (2019). Dynamics of excretion of thiodiacetic acid into urine in polyvinyl chloride production workers. International Journal of Occupational and Environmental Medicine 10(2):73-79.			
HERO ID:	5431769			
Conditions of Use:	Processing as an intermediate			
EXTRACTION				
Parameter	Data			
Number of sites:	1			
Worker activity description:	Vinyl chloride division workers			
Area sampling data:	15 - 87.2 (mg/m^3) (Pg. 74)			
Exposure duration:	The duration of the presence of workers of primary occupations in the workshops was 60-80% of the work shift, while workers of auxiliary occupations spent only 40-50% of their shift time in the workshops. Thus, workers in auxiliary occupations experience lower ranges of exposure to toxicants.			
Number of workers:	75			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Sampling or analytical methodology is not equivalent to an approved OSHA or NIOSH method and EPA review of information indicates the methodology is acceptable. Differences in methods are not expected to lead to lower quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	The data are from a non-OECD country.
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The operations, equipment, and worker activities associated with the data are expected to be representative of current operations, equipment, and activities.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include most critical metadata, such as sample type and exposure type, but lacks additional metadata, such as sample durations, exposure durations, exposure frequency, and/orworker activities.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Spittler, T. D., Bourke, J. B., Baker, P. B., Helfman, G. W. (1985). Inhalation exposure of museum personnel to ethylene dichloride-carbon tetrachloride fumigant. ACS Symposium Series 273:243-251.			
HERO ID:	5435165			
Conditions of Use:	Museum Staff			
EXTRACTION				
Parameter	Data			
Number of sites:	1			
Worker activity description:	Personnel in both the Mammals and Birds divisions, and also in the adjacent, nonfumigated, Division of Anthropology, wore battery operated air monitors throughout their daily routines.			
Exposure route:	Inhalation			
Personal sampling data:	ND - 18 (ppm) (Pg. 5)			
Number of workers:	five staff members were monitored			
Comments:	Analytic method: Accuhaler model 808 personal sampling pumps operating at 100cc/min through a 2 mm by 1 m long Tygon tube. Two different sized tubes were used, containing either 100mg or 400mg of charcoal adsorbent. Samples were then analyzed via gas chromatography. (Pg. 4)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Uninformative	Data are for museum use which is not in-scope or similar to an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty is addressed by the sampling method. Variability is not addressed.
Overall Quality Determination		Uninformative		

Study Citation:	Stantec ChemRisk, (2024). Final study report: Inhalation monitoring of 1,2-dichloroethane (CASRN 107-06-2) with cover letter.		
HERO ID:	11854585		
Conditions of Use:	Manufacturing		
EXTRACTION			
Parameter	Data		
Worker activity description:	As described in the AFSP, operators or process technicians were closely involved with the manufacturing, production as a byproduct, and handling of EDC. These workers performed routine daily tasks during the inhalation study including operating production control panels, recording process parameters into a database (e.g., ingredients, weights, temperatures, pressures), conducting walkthroughs of the production areas; approving, monitoring, and closing work permits; overseeing line breaks and process openings for maintenance; unlocking and locking equipment; training other workers; and conducting safety reviews.Additional descriptions located in Section 2.1.1.		
Exposure route:	Inhalation		
Personal sampling data:	See Tables 6-8 for summary statistics. Discrete samples provided in Appendix N.		
Exposure duration:	Full shift samples – collected over the worker or ONU’s entire shift. Sample duration should be within one hour of the typical shift length [e.g., 7-hour minimum sample duration for an 8-hour work shift (Occupational Safety and Health Administration (OSHA) 2014)].		
Personal protective equipment:	Each representative facility utilizes similar standard process area PPE, task-specific PPE, and emergency use PPE (e.g., during an accidental release, spill, or leak). The type of PPE used depends on the process area and task performed. As such, individuals in each SEG require different types of PPE dependent on the process area in which they work and the types of tasks they perform, and the specifications in the company-specific SOP. For example, maintenance technicians wore standard process area PPE while conducting maintenance tasks in production process areas but donned additional PPE as necessary for specific maintenance tasks. Similarly, at one of the facilities a laboratory technician donned additional PPE (a full-face air-purifying respirator) to dispose of the lab analyses generated hazardous waste, and when the laboratory technician returned to the laboratory, they donned the appropriate laboratory PPE. When conducting process walk-throughs or other tasks that required them to enter process areas, ONUs donned standard process area PPE. Routine tasks conducted by ONUs (e.g., office work) did not require access to process areas with exposure potential, and thus no PPE was required for these workers. Information on the standard, task-specific, and emergency PPE used across the representative facilities is summarized in Tables 12 to 14 by type of work area (i.e., production process areas including maintenance areas, logistics areas, and laboratories). Specific PPE types, brand names, material of construction, types of cartridges (for respirators), and other identifying characteristics were noted when provided. Standard PPE is considered the PPE worn during normal operations on a full to near full-shift basis. Task-specific PPE is that which is used during specific batch events, worn for the duration of the task or during specific steps in the task as specified in the company-specific SOP. Emergency PPE is used only in the event of an upset condition (e.g., spill, leak, accidental release) and is typically kept on the worker’s person for use as necessary or available in control rooms.		
Engineering control:	Engineering controls are present at all representative facilities. The types of engineering controls differed by process area (e.g., logistics, production areas, maintenance, laboratories). Production, logistics, and maintenance activities primarily occur outdoors in open air work areas with no airflow restrictions. Indoor work areas range in size and include process laboratories, maintenance workshops, and control rooms. Engineering controls are used in production areas at all representative facilities to reduce potential for worker exposures during work with and around equipment containing process chemicals. For example, some of the facilities utilize a closed loop sampling system which allows operators and technicians who collect process samples at different locations throughout the process flow to do so with no contact to process fluids or emissions. In addition, most outdoor process areas are equipped with alarms that monitor ambient air for leaks or emissions from production. Some site production areas also utilize nitrogen purges and sweeps during line connections and line openings to remove impurities prior to accessing opened process lines. Moreover, if a portion of a process line requires isolation for maintenance, the flow of product to the area can be blocked by valves and the isolated area emptied or “bled” to clear the residual product. The steps taken to control exposures at the facilities aligned with the generic SOP (included as Appendix 2 to the AFSP) developed to demonstrate engineering controls in place across the industry to reduce or eliminate inhalation exposure potential during equipment opening and sampling tasks.(More details in Section 3.2.1)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High Sampling/analytical methodology is an approved OSHA method.
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Study Citation:	Stantec ChemRisk, (2024). Final study report: Inhalation monitoring of 1,2-dichloroethane (CASRN 107-06-2) with cover letter.			
HERO ID:	11854585			
Conditions of Use:	Manufacturing			
Domain		Metric	EVALUATION	
			Rating	Comments
Domain 2: Representativeness				
	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Monitoring data were collected after the most recent PEL and no more than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	High	All metadata provided.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability addressed by samples collected at multiple sites, high number of samples collected, samples collected for multiple worker types.
Overall Quality Determination			High	

Study Citation:	Stantec ChemRisk, (2024). Final study report: Inhalation monitoring of 1,2-dichloroethane (CASRN 107-06-2) with cover letter.			
HERO ID:	11854585			
Conditions of Use:	Processing as a Reactant			
EXTRACTION				
Parameter	Data			
Worker activity description:	As described in the AFSP, operators or process technicians were closely involved with the manufacturing, production as a byproduct, and handling of EDC. These workers performed routine daily tasks during the inhalation study including operating production control panels, recording process parameters into a database (e.g., ingredients, weights, temperatures, pressures), conducting walkthroughs of the production areas; approving, monitoring, and closing work permits; overseeing line breaks and process openings for maintenance; unlocking and locking equipment; training other workers; and conducting safety reviews. Additional descriptions located in Section 2.1.1.			
Exposure route:	Inhalation			
Personal sampling data:	See Tables 6-8 for summary statistics. Discrete samples provided in Appendix N.			
Exposure duration:	Full shift samples – collected over the worker or ONU’s entire shift. Sample duration should be within one hour of the typical shift length [e.g., 7-hour minimum sample duration for an 8-hour work shift (Occupational Safety and Health Administration (OSHA) 2014)].			
Personal protective equipment:	Each representative facility utilizes similar standard process area PPE, task-specific PPE, and emergency use PPE (e.g., during an accidental release, spill, or leak). The type of PPE used depends on the process area and task performed. As such, individuals in each SEG require different types of PPE dependent on the process area in which they work and the types of tasks they perform, and the specifications in the company-specific SOP. For example, maintenance technicians wore standard process area PPE while conducting maintenance tasks in production process areas but donned additional PPE as necessary for specific maintenance tasks. Similarly, at one of the facilities a laboratory technician donned additional PPE (a full-face air-purifying respirator) to dispose of the lab analyses generated hazardous waste, and when the laboratory technician returned to the laboratory, they donned the appropriate laboratory PPE. When conducting process walk-throughs or other tasks that required them to enter process areas, ONUs donned standard process area PPE. Routine tasks conducted by ONUs (e.g., office work) did not require access to process areas with exposure potential, and thus no PPE was required for these workers. Information on the standard, task-specific, and emergency PPE used across the representative facilities is summarized in Tables 12 to 14 by type of work area (i.e., production process areas including maintenance areas, logistics areas, and laboratories). Specific PPE types, brand names, material of construction, types of cartridges (for respirators), and other identifying characteristics were noted when provided. Standard PPE is considered the PPE worn during normal operations on a full to near full-shift basis. Task-specific PPE is that which is used during specific batch events, worn for the duration of the task or during specific steps in the task as specified in the company-specific SOP. Emergency PPE is used only in the event of an upset condition (e.g., spill, leak, accidental release) and is typically kept on the worker’s person for use as necessary or available in control rooms.			
Engineering control:	Engineering controls are present at all representative facilities. The types of engineering controls differed by process area (e.g., logistics, production areas, maintenance, laboratories). Production, logistics, and maintenance activities primarily occur outdoors in open air work areas with no airflow restrictions. Indoor work areas range in size and include process laboratories, maintenance workshops, and control rooms. Engineering controls are used in production areas at all representative facilities to reduce potential for worker exposures during work with and around equipment containing process chemicals. For example, some of the facilities utilize a closed loop sampling system which allows operators and technicians who collect process samples at different locations throughout the process flow to do so with no contact to process fluids or emissions. In addition, most outdoor process areas are equipped with alarms that monitor ambient air for leaks or emissions from production. Some site production areas also utilize nitrogen purges and sweeps during line connections and line openings to remove impurities prior to accessing opened process lines. Moreover, if a portion of a process line requires isolation for maintenance, the flow of product to the area can be blocked by valves and the isolated area emptied or “bled” to clear the residual product. The steps taken to control exposures at the facilities aligned with the generic SOP (included as Appendix 2 to the AFSP) developed to demonstrate engineering controls in place across the industry to reduce or eliminate inhalation exposure potential during equipment opening and sampling tasks.(More details in Section 3.2.1)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is an approved OSHA method.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
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Study Citation:		Stantec ChemRisk, (2024). Final study report: Inhalation monitoring of 1,2-dichloroethane (CASRN 107-06-2) with cover letter.		
HERO ID:		11854585		
Conditions of Use:		Processing as a Reactant		
Domain		Metric	EVALUATION	
			Rating	Comments
	Metric 3:	Applicability	High	Data are for processing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Monitoring data were collected after the most recent PEL and no more than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	High	All metadata provided.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability addressed by samples collected at multiple sites, high number of samples collected, samples collected for multiple worker types.
Overall Quality Determination			High	

Study Citation:	Tong, R., Zhang, L.,ei, Yang, X., Liu, J., Zhou, P., Li, J. (2019). Emission characteristics and probabilistic health risk of volatile organic compounds from solvents in wooden furniture manufacturing. Journal of Cleaner Production 208:1096-1108.			
HERO ID:	5074722			
Conditions of Use:	Wood Furniture Manufacturing			
EXTRACTION				
Parameter	Data			
Worker activity description:	Edge Bonding, Veneering, Paint Mixing, Polishing varnish, Undercoating, Drying, Topcoating			
Exposure route:	Inhalation			
Area sampling data:	Concentrations (mg/m3) in various areas in furniture manufacturing workshops (p. 1101) and non-production areas (p. 1102).			
Exposure duration:	We conducted sampling three times every working day from 9:00-10:00, 15:00-16:00 and 20:00-21:00, and each sampling lasted for 1 h.			
Comments:	A portable handy air sampler (EM-500, AMAE, China), which can absorb most VOCs at a constant flow rate, was employed for gas sampling, except in the case of chloroalkanes. The relative sampling height was set at 1.5m, which represents the breathing zone of workers. We conducted sampling three times every working day from 9:00-10:00, 15:00-16:00 and 20:00-21:00, and each sampling lasted for 1 h. Chloroalkane sampling method unclear (p. 1099). Chloroalkanes were analyzed by gas Chromatography in direct injection mode in the laboratory to obtain VOC concentration data (p. 1099).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Sampling/analytical methodology is not an approved OSHA/NIOSH method but is an acceptable methodology. [Journal article]
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data are from China, a non-OECD country.
	Metric 3:	Applicability	Medium	Data are for furniture manufacturing, which is similar to the in-scope occupational scenario adhesives and sealants.
	Metric 4:	Temporal Representativeness	High	Monitoring data are no more than 10 years old. [2015-2017 annually]
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics. [range provided; number of samples unclear]
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sample type and exposure type provided but missing number of workers and number of sites. [estimates exposure durations and frequencies]
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by taking samples at different plants areas over different years, but uncertainty is not addressed. [Various samples taken in different plant areas, in different years; but only one 1 plant sampled]
Overall Quality Determination		Medium		

Study Citation:	Vallecillos, L., Espallargas, E., Allo, R., Marcé, R. M., Borrull, F. (2019). Passive sampling of volatile organic compounds in industrial atmospheres: Uptake rate determinations and application. Science of the Total Environment 666:235-244.			
HERO ID:	5068479			
Conditions of Use:	As a reactant or intermediate			
EXTRACTION				
Parameter	Data			
Number of sites:	16			
Exposure route:	Inhalation			
Area sampling data:	Zone A: ND - 0.64 (ug/m^3) (Pg. 241); Zone B: ND - 0.39 (ug/m^3) (Pg. 242)			
Comments:	Samples collected by Carbopack x tubes and analyzed by TD-GC-MS (Pg. 235)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is equivalent to an approved OSHA/NIOSH method.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Spain, an OECD country.
	Metric 3:	Applicability	High	Data are for processing as a reactant/intermediate, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Monitoring data are no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sample type and exposure type provided but missing exposure duration, exposure frequency.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by sampling multiple sites, but uncertainty is not addressed.
Overall Quality Determination			High	

Study Citation:	VI, (2026). Vinyl Institute comments on 1,2-dichloroethane regarding working year data and inhalation monitoring data.			
HERO ID:	13245902			
Conditions of Use:	Waste handling, disposal, and treatment			
EXTRACTION				
Parameter	Data			
Worker activity description:	Process operators, technicians, bio operators, maintenance supervisors, and wastewater operators			
Exposure route:	Inhalation and dermal			
Physical form:	Liquid at standard temperature, vapor at elevated temperatures.			
Personal sampling data:	Discrete sample results given in Table 6 on PDF Pg. 28-29			
Exposure duration:	Sample durations representing task lengths are given in Table 6 on PDF Pg. 28-29.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling or analytical methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for waste handling, disposal, and treatment, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Monitoring data are no more than 10 years old.
	Metric 5:	Sample Size	Medium	Statistical distribution of samples is fully characterized (discrete sampling data provided) for majority of samples, but several samples and job titles are characterize by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sample type and exposure type provided but missing information on worker activities and controls (PPE, engineering).
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by sample concentrations compiled from multiple sources/facilities, but uncertainty is not addressed.
Overall Quality Determination		Medium		

Study Citation:	Wallace, L. A., Pellizzari, E., Hartwell, T., Rosenzweig, M., Erickson, M., Sparacino, C., Zelon, H. (1984). Personal exposure to volatile organic compounds I Direct measurements in breathing-zone air, drinking water, food, and exhaled breath. Environmental Research 35(1):293-319.			
HERO ID:	21711			
Conditions of Use:	unknown			
EXTRACTION				
Parameter	Data			
Worker activity description:	Chemical and oil company workers, sewage treatment plant operator.			
Exposure route:	inhalation			
Personal sampling data:	0.65 (ug/m^3) Range O.I.O- 10.20 (Pg. 11)			
Number of workers:	9 (Pg. 2)			
Comments:	Number of samples: 163; Analytic Method: Tenax-GC			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is an approved NIOSH/OSHA method.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Medium	Data are for an unknown condition of use, which may be similar to an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Monitoring data are greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sample type and exposure type provided but missing exposure duration, exposure frequency, condition of use, physical form.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by multiple job types and functions being tested, but uncertainty is not addressed.
Overall Quality Determination		Medium		

Study Citation:	Wang, D., Yu, H., Shao, X., Yu, H., Nie, L. (2018). Direct and potential risk assessment of exposure to volatile organic compounds for primary receptor associated with solvent consumption. Environmental Pollution 233:501-509.		
HERO ID:	5550004		
Conditions of Use:	Paints		
EXTRACTION			
Parameter	Data		
Exposure route:	Inhalation		
Physical form:	Vapor		
Area sampling data:	Mean exposure: Acrylic primer: 4.6 (ug/m^3); Epoxy primer: 2.7 (ug/m^3); Acrylic topcoat: 9.0 (ug/m^3).		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	High	Sampling or analytical methodology is an approved OSHA or NIOSH method or is well described and found to be equivalent to approved OSHA or NIOSH methods.
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	The data are from a non-OECD country.
	Metric 3: Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	Report is less than 10 years old.
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Monitoring data include most critical metadata, such as sample type and exposure type, but lacks additional metadata, such as sample durations, exposure durations, exposure frequency, and/or worker activities.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by comparing different paints but uncertainty not addressed.
Overall Quality Determination		High	

Study Citation:	WHO, (1987). 1,2-Dichloroethane. 62(0):4-1 - 4-21.		
HERO ID:	22964		
Conditions of Use:	Use as a solvent		
EXTRACTION			
Parameter	Data		
Exposure route:	Inhalation		
Area sampling data:	11 - 800 (mg/m^3) (Pg. 4); Job 1 in anti-knock blending plant: 0.1 mg/m3 twa, Job 2 at same plant: 1.0 mg/m3 twa, maximum exposure was 8.9 mg/m3		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	Low	Sampling or analytical methodology is not specified or from a frequently used source.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Monitoring data is from U.S. plant
	Metric 3: Applicability	High	Data are for use as a solvent, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Low	More than 20 years old.
	Metric 5: Sample Size	Low	Distribution of samples is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Monitoring data include industry but is not clear on sample type (e.g., personal breathing zone), worker activity or other metadata.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Study does not address variability or uncertainty.
Overall Quality Determination		Low	

Study Citation:	Xing, L., Wang, L., Zhang, R. (2018). Characteristics and health risk assessment of volatile organic compounds emitted from interior materials in vehicles: a case study from Nanjing, China. Environmental Science and Pollution Research 25(15):14789-14798.			
HERO ID:	4697151			
Conditions of Use:	Distribution in commerce			
EXTRACTION				
Parameter	Data			
Worker activity description:	Source: interior of vehicles			
Exposure route:	Inhalation			
Area sampling data:	2.08 to 18.2 ug/m3, 5.51 ug/m3 (median), 5.89 ug/m3 mean (p. 14792)			
Exposure duration:	2 hr./day; assumed 10 year exposure duration because level of VOCs decrease with time (p. 14791)			
Exposure frequency:	300 dpy (p. 14791)			
Comments:	Analytic method: stainless steel canisters - analyzed with high-resolution gas chromatograph-mass spectrometer (GC-MS; Agilent 7890A Series, Agilent Technologies, USA) coupled with a mass spectrometer (MSD 5975C, Agilent Technologies, USA); Method TO-15 (p. 14790).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is an approved EPA method. [USEPA Method TO-15]
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data are from China, a non-OECD country.
	Metric 3:	Applicability	Medium	Data are for vehicle interiors, which is similar to the in-scope occupational scenario distribution in commerce [Vehicle interiors - mainly private cars - potentially applicable for Distribution in Commerce]
	Metric 4:	Temporal Representativeness	High	Monitoring data are no more than 10 years old. [2018]
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics. [range provided; number of samples unclear]
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sample type and exposure type provided but missing number of sites and number of workers. [estimates exposure durations and frequencies]
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability addressed by sampling randomly selected cars of varying ages. [23 randomly selected vehicles; varying ages; discussed calibration tests]
Overall Quality Determination		Medium		

Study Citation:	Yu, A. L., Liang, H. R., Tang, H. L., Li, A. F. (2004). Chinese. Zhonghua Laodong Weisheng Zhiyebing Zazhi / Chinese Journal of Industrial Hygiene and Occupational Diseases 22(6):426.			
HERO ID:	677648			
Conditions of Use:	Incorporation into formulation			
EXTRACTION				
Parameter	Data			
Number of sites:	1			
Worker activity description:	Mixing, separating, packaging and sealing chemical mixtures including 1,2-DCA. (Pg. 1)			
Exposure route:	Inhalation			
Area sampling data:	135 (mg/m^3) (Pg. 2)			
Exposure duration:	9-12 hours/day			
Number of workers:	1			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data are from China, a non-OECD country.
	Metric 3:	Applicability	High	Data are for incorporation into formulation, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (mean) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	Zhao, S. F., Bao, Y. S., Zhang, X. C. (1989). Studies on the effects of 1,2-dichloroethane on reproductive function. Zhonghua Yufang Yixue Zazhi / Chinese Journal of Preventive Medicine 23(4):199-202.			
HERO ID:	200708			
Conditions of Use:	Lab chemical			
EXTRACTION				
Parameter	Data			
Number of sites:	2			
Area sampling data:	1.5 - 1534 (mg/m^3) (Pg. 4)			
Number of workers:	98 workers (44 male, 54 female)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data are from China, a non-OECD country.	
	Metric 3: Applicability	High	Data are for lab chemical use, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination		Low		

Study Citation:	Frasch, H. F., Bunge, A. L. (2015). The transient dermal exposure II: post-exposure absorption and evaporation of volatile compounds. Journal of Pharmaceutical Sciences 104(4):1499-1507.			
HERO ID:	3230538			
Conditions of Use:	All - Dermal Model			
EXTRACTION				
Parameter	Data			
Dermal exposure data:	Mathematical representation of post-exposure absorption and evaporation of chemicals in the skin after exposure.			
Comments:	No mention of the assigned chemical. Mathematical representation of post-exposure absorption and evaporation of chemicals in the skin after exposure.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Model can be applied to all occupational scenarios.
	Metric 4:	Temporal Representativeness	High	Model is based on current industry conditions and based on data no more than 10 years old.
Domain 3: Accessibility/ Clarity	Metric 5:	Metadata Completeness	High	Model approach, equations, and choice of parameter values are transparent. Rationales for choice of approach, equations, and parameter values provided.
Domain 4: Variability and Uncertainty	Metric 6:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			High	

Study Citation:	Ng, M. G., Tongeren, van, M., Semple, S. (2014). Simulated transfer of liquids and powders from hands and clothing to the mouth. Journal of Occupational and Environmental Hygiene 11(10):633-644.
HERO ID:	3222353
Conditions of Use:	May apply to more than 1 COU

EXTRACTION

Parameter	Data
Exposure route:	hand/object to mouth (inadvertent ingestion)
Physical form:	liquid and powder
Dermal exposure data:	pg. 2/13: "Overall, direct transfer from the hands to the oral cavity was significantly higher (mean Transfer Efficiencies, TE = 51.6) than indirect transfer from the hands to the oral cavity via the perioral area by licking the lips (mean TE = 11.5)."Pg. 8/13: "Three transfer coefficient (TEs) are reported for indirect transfer: hand-to-perioral, perioral-to-oral, and hand-to-oral. The hand-to-oral TE describes the overall indirect transfer from the hand to the oral cavity. Liquids transferred from the perioral to the oral areamore readily than solids (mean TE liquids = 100.0%, solids = 71.2%; p = 0.029). But from the hands to the oral area there were no significant differences between transfer for solids and liquids for both direct and indirect transfer."For Solid:Hand-to-oral direct transfer mean TE%: 56.6Hand-to-perioral mean TE%: 17.4Perioral-to-oral mean TE%: 71.2Hand-to-oral (via perioral) mean TE%: 13.2Bare hands direct transfer hand to oral mean TE%: 69.7Bare hands indirect transfer hand-to-perioral mean TE%: 17.6Nitrile direct transfer hand to oral mean TE%: 70.0Nitrile indirect transfer hand-to-perioral mean TE%: 12.0 Cotton direct transfer hand to oral mean TE%: 47.7Cotton indirect transfer hand-to-perioral mean TE%: 4.8 For Liquid:Hand-to-oral direct transfer mean TE%: 36.8Hand-to-perioral mean TE%: 6.5Perioral-to-oral mean TE%: 100Hand-to-oral (via perioral) mean TE%: 6.5Bare hands direct transfer hand to oral mean TE%: 36.8Bare hands indirect transfer hand-to-perioral mean TE%: 6.5Nitrile direct transfer hand to oral mean TE%: 41.4Nitrile indirect transfer hand-to-perioral mean TE%: 8.9Cotton direct transfer hand to oral mean TE%: 31.0Cotton indirect transfer hand-to-perioral mean TE%: 5.9 For soluble powder:Hand-to-oral direct transfer mean TE%: 69.7Hand-to-perioral mean TE%: 17.6Perioral-to-oral mean TE%: 96.4Hand-to-oral (via perioral) mean TE%: 17.0For insoluble powder:Hand-to-oral direct transfer mean TE%: 50.0Hand-to-perioral mean TE%: 17.3Perioral-to-oral mean TE%: 58.6Hand-to-oral (via perioral) mean TE%: 11.3For fine MC:Hand-to-oral direct transfer mean TE%: 39.0Hand-to-perioral mean TE%: 17.8Perioral-to-oral mean TE%: 57.8Hand-to-oral (via perioral) mean TE%: 10.6For rough MC:Hand-to-oral direct transfer mean TE%: 61.0Hand-to-perioral mean TE%: 16.8Perioral-to-oral mean TE%: 59.4Hand-to-oral (via perioral) mean TE%: 12.0All of the TEs from contaminated hands to the perioral area while putting a respirator on and taking it off were below 0.5%. Two of the four transfer TEs from contaminated respirators to the perioral area were below <0.5% and the range of TEs was <0.5%–3.1%. Because the results from experiments with olive oil were considered unreliable only one scenario was assessed: transfer of calcium acetate from the pen to the oral cavity. There was therefore no scope for statistical comparison of groups. The TEs measured ranged from <0.8 to 117.7%, showing potential for a very wide range of TEs.Transfer When Wiping the Perioral Area with the Arm or Cotton SleeveFor Vinegar: Bare Arms Arm-to-Perioral mean TE%: 13.1Cotton Sleeve Arm-to-Perioral mean TE%: 1.0For Calcium Acetate: Bare Arms Arm-to-Perioral mean TE%: 26.8Cotton Sleeve Arm-to-Perioral mean TE%: 5.0All of the TEs from contaminated hands to the perioral area while putting a respirator on and taking it off were below 0.5%. Two of the four transfer TEs from contaminated respirators to the perioral area were below <0.5% and the range of TEs was <0.5%–3.1%. Because the results from experiments with olive oil were considered unreliable only one scenario was assessed: transfer of calcium acetate from the pen to the oral cavity. There was therefore no scope for statistical comparison of groups. The TEs measured ranged from <0.8 to 117.7%, showing potential for a very wide range of TEs.Transfer When Wiping the Perioral Area with the Arm or a Cotton SleeveFor Vinegar: Bare Arms Arm-to-Perioral mean TE%: 13.1Cotton Sleeve Arm-to-Perioral mean TE%: 1.0For Calcium Acetate: Bare Arms Arm-to-Perioral mean TE%: 26.8Cotton Sleeve Arm-to-Perioral mean TE%: 5.0 pg. 2/13: Observational studies of adults have shown average hand-to-mouth contact frequencies of 2–5 contacts per hour
Exposure frequency:	
Comments:	This data source contains laboratory measurements of the transfer efficiency associated with exposure resulting from inadvertent ingestion because of hand/object -to-mouth transfer. The reported transfer efficiencies pertain to surrogate chemicals. An equation is given for calculating exposure resulting from inadvertent ingestion from these transfer efficiencies. pg. 12/13: "This study has provided evidence that transfer of chemicals from the hands or objects to the mouth is influenced by parameters including physical state, chemical/physical properties, and use of protective clothing. These findings may have implications for exposure modeling and exposure control. This work was preliminary in nature and additional study is required to obtain a greater understanding of the parameters that can affect transfer and the possible interactions between them."

EVALUATION

Domain	Metric	Rating	Comments
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Study Citation:		Ng, M. G., Tongeren, van, M., Semple, S. (2014). Simulated transfer of liquids and powders from hands and clothing to the mouth. Journal of Occupational and Environmental Hygiene 11(10):633-644.		
HERO ID:		3222353		
Conditions of Use:		May apply to more than 1 COU		
Domain	Metric	EVALUATION		Comments
		Rating		
Domain 1: Reliability				
	Metric 1: Methodology	High		The equation for amount inadvertently ingested is reasonable. The method of measuring transfer efficiency is sound.
Domain 2: Representativeness				
	Metric 2: Geographic Scope	N/A		The geographic attribute is not relevant in the case of a mathematical model and data obtain via laboratory experiments.
	Metric 3: Applicability	High		Inadvertent digestion is tentatively in scope (EPA will consider this scenario according to the Scope Documents.)
	Metric 4: Temporal Representativeness	High		The data were generated less than 10 years ago.
Domain 3: Accessibility/ Clarity				
	Metric 5: Metadata Completeness	High		Meta data is complete.
Domain 4: Variability and Uncertainty				
	Metric 6: Metadata Completeness	High		Variability and uncertainty are well characterized.
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2013). Updating CEB’s method for screening-level estimates of dermal exposure.			
HERO ID:	11224653			
Conditions of Use:	All			
EXTRACTION				
Parameter	Data			
Dermal exposure data:	This document provides updates to the parameters used for dermal exposure estimates. Updated parameters are listed below: Routine, direct handling of solids with 2 hands Resulting dermal contact: up to 3,100 mg Routine contact with surfaces, 2 hands, solids Resulting dermal contact: up to 1,100 mg Routine immersion, 2 hands, liquids Surface area: 1,070 cm^2 Amount retained on skin: 1.3-10.3 mg/cm^2 Resulting dermal contact: up to 11,000 mg Routine contact, 2 hands, liquids Surface area: 1,070 cm^2 Amount retained on skin: 0.7-2.1 mg/cm^2 Resulting dermal contact: up to 2,200 mg Incidental contact, 2 hands, liquids Surface area: 1,070 cm^2 Amount retained on skin: 0.7-2.1 mg/cm^2 Resulting dermal contact: up to 2,200 mg Incidental contact, 1 hand, liquids Surface area: 535 cm^2 Amount retained on skin: 0.7-2.1 mg/cm^2 Resulting dermal contact: up to 1,100 mg			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Document published by EPA CEB.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	from US	
	Metric 3: Applicability	High	Data are applicable to all COUs involving dermal contact.	
	Metric 4: Temporal Representativeness	Medium	published 2013	
Domain 3: Accessibility/ Clarity	Metric 5: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 6: Metadata Completeness	Medium	Variability addressed by describing dermal exposure parameters for different exposure scenarios but uncertainty is not addressed.	
Overall Quality Determination		High		

Study Citation:	Zhao, D., Little, J. C., Hodgson, A. T. (2002). Modeling the reversible, diffusive sink effect in response to transient contaminant sources. Indoor Air 12(3):184-190.			
HERO ID:	2889887			
Conditions of Use:	General Occupational Indoor Environments			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation			
Comments:	Equation to model sink-effect of diffusion controlled indoor materials.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Model is free of mathematical errors and based on sound approaches/methods; however, choice of equations and parameters are not specific to chemical of interest.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Model can be applied to indoor air concentration, in-scope for multiple occupational scenarios.
	Metric 4:	Temporal Representativeness	Medium	Model is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
Domain 3: Accessibility/ Clarity	Metric 5:	Metadata Completeness	Medium	Model approach, equations, and choice of parameter values are transparent. Rationales for choice of approach, equations, and parameter values are not provided. [General equation may be used]
Domain 4: Variability and Uncertainty	Metric 6:	Metadata Completeness	Medium	Variability addressed by modeling different scenarios, but uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	ATSDR, (2001). Toxicological profile for 1,2-dichloroethane.			
HERO ID:	412348			
Conditions of Use:	Manufacture, processing, use			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation			
Area sampling data:	1,2-Dichloroethane was detected at a mean concentration of 0.09 µg/m3 in workplaces where smoking is not permitted and at a mean concentration of 0.03 µg/m3 in workplaces where smoking is permitted.			
Number of workers:	1.35 million (Pg. 195)			
Comments:	Analyzed via GC/MS-thermal desorption in a fused silica capillary column.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (mean) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	Donohue, M. (1980). Health hazard evaluation report no. HETA 79-80 and 81-746, Cobe Laboratories, Inc., Lakewood and Arvada, Colorado.			
HERO ID:	6558308			
Conditions of Use:	Adhesives and sealants			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation			
Personal sampling data:	Solvent room worker: 1.5 - 3.4 (ppm) (Pg. 20)			
Area sampling data:	Area: 1.5 - 32 (ppm) (Pg. 3); Solvent room area: 0.6 - 0.7 (ppm); Solvent storage area: ND (ppm) (Pg. 17); Monitoring lines production: 17 - 32 (ppm) (Pg. 11); Blood filters & cardiotomy reservoirs: 9 (ppm)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for adhesives and sealants, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (mean) but discrete samples not provided and distribution not fully characterized.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by multiple sampling locations but uncertainty is not addressed.	
Overall Quality Determination		Medium		

Study Citation:	Dow Chemical, (1983). 1982 industrial hygiene survey environmental operations department.			
HERO ID:	1973135			
Conditions of Use:	Distribution in Commerce			
EXTRACTION				
Parameter	Data			
Number of sites:	1			
Worker activity description:	Unloading chlorinated organic compounds from tank trucks; drum washing			
Personal sampling data:	ND (Pg. 5)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Assessment uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for distribution in commerce, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	Dow Chemical, (1983). Evaluation of exposures to ethylene dichloride and Telone II at antifreeze/coolants unit (sanitized).			
HERO ID:	4840715			
Conditions of Use:	Import			
EXTRACTION				
Parameter	Data			
Number of sites:	1			
Worker activity description:	Drumming of 1,2-DCA (Pg. 4)			
Exposure route:	Inhalation			
Physical form:	Liquid			
Personal sampling data:	Drumming operator PBZ: 0.06 - 3.1 (ppm) (Pg. 12)			
Area sampling data:	Drumming area: 2 - 13.4 (ppm) (Pg. 13-14)			
Exposure duration:	Table 5 has 8 hr TWA, Table 6 has short term values			
Engineering control:	Local exhaust ventilation			
Comments:	Samples were collected in 150mg charcoal tubes and desorbed into carbon disulfide. Samples were then analyzed using gas chromatography. (Pg. 3)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Assessment uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for import, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by testing different types of PPE, but uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	Dow Chemical, (1991). Occupational health summary report - Unit I (vinyl chloride production) with cover sheets and letter dated 062091 (sanitized).			
HERO ID:	5447147			
Conditions of Use:	Distribution in Commerce			
EXTRACTION				
Parameter	Data			
Worker activity description:	Loading technician			
Personal sampling data:	8-hr TWA: 0.94 (ppm) (Pg. 7); Short term: 0.17 - 11 (ppm)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Assessment uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for distribution in commerce, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution characterized by limited statistics but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	ENSR, (1991). AB 2588 health risk assessment for the Texaco Refinery Areas 1 and 2 Bakersfield, California.			
HERO ID:	6338980			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation			
Area sampling data:	ND (ug/m^3) (Pg. 262)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for disposal, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (annual average) but discrete samples not provided and distribution not fully characterized.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination		Medium		

Study Citation:	Ethyl Corporation, (1983). Industrial hygiene survey date of survey: May 22-27, 1983.		
HERO ID:	1579734		
Conditions of Use:	Unknown (see comments)		
EXTRACTION			
Parameter	Data		
Worker activity description:	Stainless operator, reactor operator		
Exposure route:	Inhalation		
Personal sampling data:	0.5 - 4.4 (ppm) (Pg. 10)		
Comments:	The processes that were monitored are "BCL 462, BT 93, TBPA, and 105". This makes it hard to know what these processes are.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	Uninformative	Condition of use is unknown.
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by different worker groups being tested but uncertainty is not addressed.
Overall Quality Determination		Uninformative	

Study Citation:	Ethyl Corporation, (1980). Industrial hygiene survey Saytech Chemicals date of survey: November 6-7, 1980.			
HERO ID:	3037459			
Conditions of Use:	As a reactant or intermediate			
EXTRACTION				
Parameter	Data			
Number of sites:	1			
Worker activity description:	PBZ: Stainless operator, reactor operator, centrifuge operator, maintenance.; Area: Reactor area, stainless area, centrifuge, vibrating hopper (EDC spill).			
Exposure route:	Inhalation			
Personal sampling data:	PBZ: 0.9 - 120 (ppm) (Pg. 10)			
Area sampling data:	Area: 2.1 - 380 (ppm) (Pg. 12)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for processing as a reactant or intermediate, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by testing multiple job types and work areas but uncertainty is not addressed.
Overall Quality Determination		Medium		

Study Citation:	Evans, W. (1979). Health hazard evaluation determination, report no. HE-77-73-610, Velsicol Chemical Corporation, 500 North Bankson Street, St. Louis, Michigan.			
HERO ID:	6558531			
Conditions of Use:	Processing			
EXTRACTION				
Parameter	Data			
Worker activity description:	Shoveling of crock filters, removing a sample from the blender/dryer, drumming, and taping waste products into drums. (Pg. 17)			
Personal sampling data:	#1 Operators: 6.7 - 7.0 (ppm) (Pg. 17); Fine chemicals department operators: 6.3 - 7.3 (ppm) (Pg. 18); HBCD section: ND - 11.6 (ppm) (Pg. 34); DMC section: 0.6 - 13.8 (ppm)			
Engineering control:	Local exhaust ventilation with slot velocities of 25 - 75 fpm (Pg. 18)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data is for processing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (range) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by multiple sampling locations but uncertainty is not addressed.
Overall Quality Determination		Medium		

Study Citation:	Fannick, N. (1980). Health hazard evaluation determination report no. HETA 77-99-726, Dupont, Chambers Works, Deepwater, NJ.			
HERO ID:	6558518			
Conditions of Use:	Processing as an intermediate			
EXTRACTION				
Parameter	Data			
Area sampling data:	12 - 53 (ng/m^3) (Pg. 5)			
Personal protective equipment:	Rubberized protective clothing, goggles, hardhats, and NIOSH approved respirators. (Pg. 3)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for processing as an intermediate, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (min, max) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	FDA, (1981). The sampling quantification of emissions from various laboratory sources and the determinations of ambient level concentrations with attached report and cover letter dated 081882.			
HERO ID:	4214079			
Conditions of Use:	Lab chemical			
EXTRACTION				
Parameter	Data			
Worker activity description:	Laboratory use of chemical			
Exposure route:	Inhalation			
Area sampling data:	ND - 103.7 (ppb) (Pg. 153 - 171)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for laboratory use, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by sampling different locations, but uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	Gorman, R., Schloemer, J. (1982). Health hazard evalution report, No. HETA-80-186-1149, TLB Plastics Corporation, Marion, Indiana.			
HERO ID:	6558314			
Conditions of Use:	Adhesives and sealants			
EXTRACTION				
Parameter	Data			
Worker activity description:	Packer/inspector location			
Area sampling data:	Area: 22 - 44 (ppm) (Pg. 7)			
Number of workers:	59			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for adhesives and sealants, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (range) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	Harley, K. G., Calderon, L., Nolan, S., J.E., Maddalena, R., Russell, M., Roman, K., Mayo-Burgos, S., Cabrera, J., Morga, N., Bradman, A. (2021). Changes in Latina women’s exposure to cleaning chemicals associated with switching from conventional to ”green” household cleaning products: The LUCIR intervention study. Environmental Health Perspectives 129(9):97001.			
HERO ID:	9551210			
Conditions of Use:	Solvents (for cleaning and degreasing).			
EXTRACTION				
Parameter	Data			
Worker activity description:	Cleaning of homes, including surfaces, mirrors, windows, other glass, toilets, tubs and showers, and floors, with regular and ”green” cleaning products.			
Exposure route:	Inhalation			
Physical form:	Liquid.			
Personal sampling data:	0.33 (ug/m^3) for conventional cleaning products and 0.26 (ug/m^3) for ”green” cleaning products.			
Exposure duration:	Duration of exposure ranges from 10 minutes to several hours.			
Exposure frequency:	Frequency of exposure includes daily, a few times a week, once a week, a few times a month, once a month, and rarely/never.			
Number of workers:	50			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for solvents used as cleaning products, which is an in-scope occupational sce- nario.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (mean, minimum, maximum, and percentiles ranging from 25th to 95th) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty is addressed by sampling methods. Variability addressed by considering various cleaning products and activities.
Overall Quality Determination		High		

Study Citation:	Hughes, K. (1995). No. 176. 1,2-dichloroethane.			
HERO ID:	5447627			
Conditions of Use:	Laboratory chemical			
EXTRACTION				
Parameter	Data			
Number of sites:	1			
Worker activity description:	Operator			
Personal sampling data:	Personal: 52.87 mg/m3			
Area sampling data:	Electron microscopy preparation laboratory: 19.8 mg/m3; Average concentration in the preparation room: 35.1 mg/m3 (Pg. 23)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Assessment uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data are from China, a non-OECD country.
	Metric 3:	Applicability	High	Data are for laboratory use, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (mean) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by showing both area and PBZ samples but uncertainty is not addressed.
Overall Quality Determination			Low	

Study Citation:	Hughes, K. (1995). No. 176. 1,2-dichloroethane.			
HERO ID:	5447627			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Worker activity description:	28% of employees working with adhesives and solvents were exposed to 1,2-dichloroethane, while between 5 and 9% of workers were exposed to the substance in the medicinals and botanicals, biological products, petroleum refining and organic chemicals industries, and in museums and art galleries			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from U.S.	
	Metric 3: Applicability	High	Data are for manufacturing, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The assessment does not address variability or uncertainty.	
Overall Quality Determination		Medium		

Study Citation:	Hughes, K. (1995). No. 176. 1,2-dichloroethane.			
HERO ID:	5447627			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Number of sites:	3			
Worker activity description:	Operator			
Area sampling data:	Mean concentrations of 1,2-dichloroethane at three production plants in the United Kingdom in 1990 were 2.8, 3.2 and 6.8 mg/m3 (0.7, 0.8 and 1.7 ppm); 95% of samples contained less than 20 mg/m3 (5 ppm), while maximum values at the plants were 18, 80 and 160 mg/m3 (4.5, 20 and 40 ppm) (Pg. 23)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Assessment uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	High	Data are for manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (mean) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by showing both area and PBZ samples but uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	Mannetje, A., Douwes, J., Glass, B., Hinz, R., Mclean, D., Pearce, N. (2019). Fumigant and chemical residue 8-hour exposures in workers handling cargo from shipping containers and export logs in New Zealand. Occupational and Environmental Medicine 76(Suppl. 1):A9-A10.			
HERO ID:	6152627			
Conditions of Use:	Fumigant and Distribution in Commerce			
EXTRACTION				
Parameter	Data			
Worker activity description:	Handling cargo from shipping containers or export logs.			
Exposure route:	Inhalation			
Comments:	measurements for 1,2-DCA are not presented.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Assessment uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from the New Zealand, an OECD country.
	Metric 3:	Applicability	High	Data are for distribution in commerce, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	N/A	1,2-DCA results not presented
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	N/A	1,2-DCA results not presented
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	1,2-DCA results not presented
Overall Quality Determination			High	

Study Citation:	NIOSH, (1982). Health hazard evaluation report: HETA 82-014-1057. Computer Services of Roanoke, Inc., Roanoke, VA.			
HERO ID:	8630652			
Conditions of Use:	Lubricants and greases			
EXTRACTION				
Parameter	Data			
Worker activity description:	Operation of the mechanical check signing, paper perforation and carbon paper removal (decollater) operations.			
Exposure route:	Inhalation.			
Area sampling data:	Non-detectable (<6ppm) concentrations were observed for 1,2-dichloroethane.			
Engineering control:	Particulate charcoal filters and room ventilation at a rate of 0.76 cfm/ft^2.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for solvents used as lubricants and greases, which is an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	OECD, (2009). Emission scenario document on adhesive formulation.			
HERO ID:	3827299			
Conditions of Use:	Adhesives and sealants			
EXTRACTION				
Parameter	Data			
Worker activity description:	Unloading, container cleaning, mixing operations, sampling, equipment cleaning, packaging			
Exposure route:	Dermal and inhalation			
Area sampling data:	Dermal: Provides methods for modeling exposures to both solids and non-volatile liquids Inhalation: Provides methods for modeling exposures to both solids and volatile liquids			
Exposure frequency:	Methodology for calculating days/yr described in Section 3.7			
Number of workers:	22 workers/site			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This ESD was developed by EPA based on U.S. data
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Low	Model results characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions and types of adhesives.
Overall Quality Determination		Medium		

Study Citation:	OECD, (2013). Emission scenario document on the industrial use of adhesives for substrate bonding.		
HERO ID:	3827300		
Conditions of Use:	Adhesives and sealants		
EXTRACTION			
Parameter	Data		
Worker activity description:	unloading, container cleaning, adhesive application, equipment cleaning, curing/drying		
Exposure route:	Dermal and inhalation		
Area sampling data:	Dermal: Provides methods for modeling exposures to solids and non-volatile liquids Inhalation: Provides methods for modeling exposures to mists and volatile liquids		
Number of workers:	26-106 workers/site		
Personal protective equipment:	Chemical-resistant gloves and safety glasses. Heat-resistant gloves are used when applying hot-melt adhesives.		
Engineering control:	Spray booths		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions, types of adhesives, and end use markets.
Overall Quality Determination		High	

Study Citation:	OECD, (2010). Emission scenario document on formulation of radiation curable coatings, inks and adhesives.			
HERO ID:	3840003			
Conditions of Use:	Formulation of Coatings, inks, and adhesives			
EXTRACTION				
Parameter	Data			
Worker activity description:	Unloading, container cleaning, sampling, equipment cleaning, filter media changeout, packaging			
Exposure route:	dermal and inhalation			
Area sampling data:	dermal: Provides methods for modeling exposures to both solids and non-volatile liquids Inhalation: Provides methods for modeling exposures to both solids and volatile liquids			
Exposure frequency:	Annual number of days the radiation curable product is formulated at each facility (days/yr) described in Section 3.7			
Number of workers:	18-39 workers/site			
Personal protective equipment:	Fabric or non-woven long sleeved shirts and pants, coveralls, and neoprene or rubber gloves. Barrier creams may be used to facilitate hand washing when materials or products penetrate gloves or other PPE. A rubber apron or rubber suit and rubber boots may also be worn in cases where there is potential for splashing on or penetration through clothing			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This ESD was developed by EPA based on U.S. data
	Metric 3:	Applicability	Medium	The assessment is for an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, in terms of the type of industry, operations, and work activities.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions and types of UV curable products.
Overall Quality Determination		Medium		

Study Citation:	OECD, (2002). SIDS initial assessment report: 1,2-dichloroethane. :203.		
HERO ID:	5160031		
Conditions of Use:	Manufacture		
EXTRACTION			
Parameter	Data		
Exposure route:	Inhalation		
Area sampling data:	Production facility air: 4.59 (mg/m^3) (Pg. 14); Maintenance/cleaning: <2 - 151 (mg/m^3) (Pg. 16)		
Number of workers:	maintenance: 10-20 (Pg. 16)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Germany, an OECD country.
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium	

Study Citation:	OECD, (2012). Emission scenario document on chemicals used in oil well production.			
HERO ID:	6387322			
Conditions of Use:	Fuels and related products			
EXTRACTION				
Parameter	Data			
Worker activity description:	Unloading, container cleaning, equipment/storage tank cleaning			
Exposure route:	Dermal			
Area sampling data:	dermal: Provides methods for modeling exposures to non-volatile liquids			
Number of workers:	8 workers/site			
Personal protective equipment:	Impervious gloves, clothing, safety glasses, masks or respirators			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This ESD was developed by EPA based on U.S. data
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Low	Model results characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering on- and off-shore wells and chemical functions.
Overall Quality Determination		Medium		

Study Citation:	Oil,, Shell (1986). Interoffice memorandum regarding monitoring results of VCM shutdown with attachments and cover sheet.		
HERO ID:	5447296		
Conditions of Use:	Processing as an intermediate		
EXTRACTION			
Parameter	Data		
Worker activity description:	Craftsmen working near sewer after reactor flushing; EDC operator		
Exposure route:	Inhalation		
Personal sampling data:	Long term: <1 - >10 (ppm) (Pg. 3); EDC operator: 0.3 - 10 (ppm) (Pg. 6); VCM operator: <1 - 10 (ppm) (Pg. 8); Utility operator: <1 - 2 (ppm) (Pg. 11); HCIN operator: <1 - 1 (ppm) (Pg. 15); Oxy operator: <1 - 4 (ppm) (Pg. 16); Foreman: <1 - 5 (ppm) (Pg. 18); Pipefitter: <1 - <2 (ppm) (Pg. 19); Industrial hygienist: <1 (ppm) (Pg. 20); Hydroblaster: 3 (ppm) (Pg. 21); Laborer: 71 (ppm) (Pg. 22); Boilermaker: <1 - 2 (ppm) (Pg. 25) Short term: <1 - >10 (ppm);		
Area sampling data:	Craftsman area: 500 (ppm) (Pg. 4)		
Personal protective equipment:	Fresh air supply respirators (Pg. 4)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Assessment uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	High	Data are for processing as an intermediate, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by multiple job types being analyzed but uncertainty is not addressed.
Overall Quality Determination		Medium	

Study Citation:	Pan, Y., Liu, Q., Liu, F. F., Qian, G. R., Xu, Z. P. (2011). Regional assessment of ambient volatile organic compounds from biopharmaceutical R&D complex. Science of the Total Environment 409(20):4289-4296.		
HERO ID:	1000487		
Conditions of Use:	Incorporation into formulation		
EXTRACTION			
Parameter	Data		
Number of sites:	1		
Exposure route:	Inhalation		
Area sampling data:	2.4 (ug/m^3) (Pg. 4292)		
Number of workers:	1200		
Comments:	Analyzed by US EPA TO-14. y. Sampling was carried out fromMay to July, in 2009. Twenty-four hour (from 9:00 am of one day to9:00 am of the next day) average concentration was measured for theambient VOCs in the complex		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Assessment uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data are from China, a non-OECD country.
	Metric 3: Applicability	High	Data are for incorporation into formulation, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (mean) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by multiple locations being sampled but uncertainty is not addressed.
Overall Quality Determination		Medium	

Study Citation:	Qin-li, Zhang, Qiao, Niu, Lai-yu, Li, Li-jun, Yang, Xiao-li, Guo, Jian-xun, Huang, Lin-ping, Wang, You-xin, Liang (2010). Toxic encephalopathy induced by occupational exposure to 1,2-dichloroethane and toxicological effect on animal model. :89-93.			
HERO ID:	4492125			
Conditions of Use:	Adhesives and Sealants			
EXTRACTION				
Parameter	Data			
Worker activity description:	Bonding toy components with adhesives			
Exposure route:	Inhalation			
Personal sampling data:	2.1 - 10.3 (mg/m^3) (Pg. 2)			
Exposure duration:	up to 12 hours a day			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	Assessment uses high quality data that are not from frequently-used sources and there are no known quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data are from China, a non-OECD country.	
	Metric 3: Applicability	High	Data are for adhesives and sealants, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination		Low		

Study Citation:	U.S. EPA, (2023). Use of laboratory chemicals - Generic scenario for estimating occupational exposures and environmental releases (Revised draft generic scenario).			
HERO ID:	10480466			
Conditions of Use:	Laboratory Chemicals			
EXTRACTION				
Parameter	Data			
Worker activity description:	Container unloading (liquids and solids), container cleaning, equipment cleaning, laboratory analyses, disposal of laboratory chemicals .			
Exposure route:	Dermal, Inhalation			
Physical form:	Liquid or solid.			
Personal sampling data:	Inhalation: Provides methods for modeling exposures to non-volatile and volatile liquids and solids.			
Dermal exposure data:	Dermal: Provides methods for modeling exposures to non-volatile and volatile liquids and solids.			
Exposure duration:	8-12 hr/day .			
Exposure frequency:	250 days/yr .			
Number of workers:	3 workers/facility and 3 ONUs/facility.			
Personal protective equipment:	Basic PPE includes wearing long sleeves (lab coats), long pants, closed-toe shoes, safety glasses or goggles, and gloves during the use of laboratory chemicals. Additional PPE may be worn depending on the level of hazard or specifics of the process.			
Engineering control:	Fume hood.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality information/data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data.
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2022). Chemical repackaging - Generic scenario for estimating occupational exposures and environmental releases (revised draft).			
HERO ID:	11182966			
Conditions of Use:	Repackaging			
EXTRACTION				
Parameter	Data			
Worker activity description:	Unloading transport containers, container cleaning, equipment cleaning, loading of transport containers. (page 12 of 116, see table 5-1 on page 35 for more detail on exposure route for each activity, as well as section 5.5 (pg 40) to section 5.8 (pg 49) for detailed descriptions of calculating each of the four activity exposures.			
Exposure route:	Dermal, Inhalation (page 12 of 116)			
Physical form:	Liquid or solid (page 12 of 116)			
Area sampling data:	Inhalation: Provides methods for modeling exposures to non-volatile and volatile liquids and solids. See calculations in sections 5.5-5.8 (page 40-49)			
Dermal exposure data:	dermal: Provides methods for modeling exposures to non-volatile and volatile liquids and solids. See calculations in sections 5.5-5.8 (page 40-49)			
Exposure duration:	8-12 hr/day (page 15 of 116)			
Exposure frequency:	The number of operating days is given in a range of 174-260 days/yr with an EPA default of 260 days/yr. (page 15 of 116)			
Number of workers:	3 workers/facility and 1 ONUs/facility (total number of employees and facilities given in Table 5-3) (page 38 of 116)			
Personal protective equipment:	Commonly used PPE includes safety glasses, face shields, aprons, and gloves. (page 36 of 116)			
Engineering control:	Local exhaust ventilation (page 22 of 116)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality information/data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data	
	Metric 3: Applicability	Medium	Data are for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized (discrete use amounts provided).	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple worker activities.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2014). Generic scenario draft on the use of additives in plastic compounding.		
HERO ID:	3827195		
Conditions of Use:	Plastic and rubber products		
EXTRACTION			
Parameter	Data		
Worker activity description:	Unloading and charging additives to process, container cleaning, equipment cleaning, and compounding processes.		
Exposure route:	Dermal and inhalation.		
Area sampling data:	Dermal: Provides methods for modeling exposures to both solids and non-volatile liquidsInhalation: Provides methods for modeling exposures to both solids and volatile liquids		
Exposure frequency:	148-264 days/yr.		
Number of workers:	24 workers/site.		
Engineering control:	Forced ventilation.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Low	Model results characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic types, additive types, and worker activities.
Overall Quality Determination		Medium	

Study Citation:	U.S. EPA, (2004). Use of additives in foamed plastics – generic scenario for estimating occupational exposures and environmental releases – Draft.			
HERO ID:	6304171			
Conditions of Use:	Flexible and rigid polyurethane foam manufacture			
EXTRACTION				
Parameter	Data			
Worker activity description:	Transfer from shipping containers, operation/supervision of the foam mix head/dispenser, foam production, transfer/handling of foamed articles.			
Exposure route:	Dermal and inhalation.			
Exposure duration:	8 hr/day.			
Exposure frequency:	250 days/yr.			
Number of workers:	<50 workers/site.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data.
	Metric 3:	Applicability	Low	COU is similar to an occupational scenario within the scope
	Metric 4:	Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Low	Number of workers characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple foam types.
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2004). Additives in plastics processing (compounding) – generic scenario for estimating occupational exposures and environmental release – Draft.		
HERO ID:	6311218		
Conditions of Use:	Plastics compounding		
EXTRACTION			
Parameter	Data		
Worker activity description:	Unloading and charging additives to process, container cleaning, equipment cleaning, and compounding processes		
Exposure route:	dermal and inhalation		
Personal sampling data:	Inhalation: Provides methods for modeling exposures to both solids and volatile liquids”		
Dermal exposure data:	dermal: Provides methods for modeling exposures to both solids and non-volatile liquids.		
Exposure frequency:	148-264 days/yr		
Number of workers:	24 workers/site		
Engineering control:	Forced ventilation		
Comments:	Generic Scenario. Not specific to 1,2-Dichloroethane.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data
	Metric 3: Applicability	Uninformative	The assessment is from an occupational or non-occupational scenario that does not apply to any occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Low	Model results characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic types, additive types, and worker activities.
Overall Quality Determination		Uninformative	

Study Citation:	U.S. EPA, (2003). Transportation equipment cleaning - Generic scenario for estimating occupational exposures and environmental releases (draft).			
HERO ID:	6385708			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Worker activity description:	The greatest potential for worker exposure to materials last transported occurs during heel removal.			
Personal protective equipment:	Facility personnel typically wear coveralls, safety shoes, protective glasses, and gloves during tank cleaning.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality information/data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data.
	Metric 3:	Applicability	Medium	Data are for multiple in-scope occupational scenarios; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2014). Use of additives in the thermoplastic converting industry - generic scenario for estimating occupational exposures and environmental releases.			
HERO ID:	6385711			
Conditions of Use:	Plastic material and resin manufacturing			
EXTRACTION				
Parameter	Data			
Worker activity description:	Unloading and charging compounded resins to process, converting processes, converting equipment cleaning, trimming processes.			
Exposure route:	Dermal and inhalation.			
Personal sampling data:	Inhalation: Provides methods for modeling exposures to both solids and volatile liquids.			
Dermal exposure data:	Dermal: Provides methods for modeling exposures to both solids and non-volatile liquids.			
Exposure frequency:	137 (average)-254 days/yr.			
Number of workers:	30-69 workers/site.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data.	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Low	Model results characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic types, additive types, and worker activities.	
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2004). Additives in plastics processing (converting into finished products) -generic scenario for estimating occupational exposures and environmental releases. Draft.
HERO ID:	6549571
Conditions of Use:	Additives in Plastics Processing (Converting into Finished Products)

EXTRACTION	
Parameter	Data
Worker activity description:	Receipt of compounded resin, Forming (Heating), Molding/Shaping, Trimming, Finishing (including coating)
Exposure route:	Inhalation and Dermal
Physical form:	Exposure to solids during unloading of compounded resin from transport containers and charging to forming operation; Exposure to dusts generated from converting processes; Exposure to liquids during equipment cleaning of equipment; Exposure to solids during trimming activities.
Personal sampling data:	Exposure from Unloading and Charging Compounded Resin; Exposure from Converting Processes; Exposure from Trimming Processes: Inhalation exposure = OSHA PEL x breathing rate x hours x fraction of additive in resin x fraction of chemical in additive (if applicable)Exposure from Converting Equipment Cleaning: Not expected, particles are expected to be contained in water.
Dermal exposure data:	Exposure from Unloading and Charging Compounded Resin:Plastics are transported as pellets, sheets, films or pipes (Kirk-Othmer), which consist of large particles sizes (although some dust may be generated during transportation). Additives are incorporated into the plastic material. Some surface contact may occur; however, dermal exposure is non-quantifiable.Exposure from Converting Processes: Not expected, converting processes typically take place at high temperatures.Exposure from Converting Equipment Cleaning: Dermal Exposure = liquid amount on skin x area of skin x # of incidents x fraction of chemical in additive x fraction of additive in resin x fraction of resin in waterExposure from Trimming Processes: Additives are incorporated into the plastic material. Some surface contact may occur; however, dermal exposure is non-quantifiable.
Exposure duration:	8 hours/day assumed for inhalation calculations
Exposure frequency:	CEB standard assumption, 250 days per year based on 5 day work week and two weeks per year of operation shut down.
Number of workers:	Overall, there were 736,698 workers employed in the Plastic Product Manufacturing industry in 2001. Table 1 provides Number of Workers for subcategories of NAICS 3261 Plastic Product Manufacturing.
Engineering control:	Water: According to the Development Document for Effluent Limitation Guidelines for the Plastics Molding and Forming Point Source Category (1984), approximately 31% of surveyed sites that use process water directly discharged their process water; 44% indirectly discharged (POTW); and 25% had a zero discharge. Zero discharge methods include recycling, evaporation pond, septic tank with leach field, evaporation from equipment, land application, and contract haul. Types of on-site treatment include settling, pH adjustment, activated sludge, activated carbon adsorption, filtration, and vacuum filtration.Air: The Emissions Scenario Document on Plastic Additives suggests that bag filters used to collect particulate emissions are 99% efficient. However, the prevalence of bag filter use was not available.

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment uses high quality data that are from a frequently used source and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	Medium	The assessment is for an occupational scenario within the scope of the risk evaluation. However, data are not chemical specific.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.

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Study Citation:	U.S. EPA, (2004). Additives in plastics processing (converting into finished products) -generic scenario for estimating occupational exposures and environmental releases. Draft.			
HERO ID:	6549571			
Conditions of Use:	Additives in Plastics Processing (Converting into Finished Products)			
			EVALUATION	
Domain		Metric	Rating	Comments
	Metric 5:	Sample Size	N/A	Sample size criteria are not applicable to data extracted.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability in worker activities is captured through identification of various NAICS codes associated with plastic additive use, but uncertainty associated with number of workers is not characterized.
Overall Quality Determination			Medium	

Study Citation:	Velsicol Chem Corp, (1978). Industrial hygiene survey, Velsicol Chemical Corporation, El Dorado, Ark Plant, Fire Master 680 Unit and semi-works summary with attachments and cover letter dated 07/19/78.			
HERO ID:	1928232			
Conditions of Use:	As a reactant or intermediate			
EXTRACTION				
Parameter	Data			
Worker activity description:	HBCD production			
Exposure route:	Inhalation			
Personal sampling data:	1.6 - 7.8 (ppm) (Pg. 20)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for processing as a reactant or intermediate, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	Velsicol Chem Corp. (1978). Industrial hygiene survey on dibromochloropropane and other chemicals with attachments and cover letter dated 071978.			
HERO ID:	4822393			
Conditions of Use:	Processing as an intermediate			
EXTRACTION				
Parameter	Data			
Number of sites:	1			
Worker activity description:	Operator			
Exposure route:	Inhalation			
Physical form:	vapor			
Personal sampling data:	0.02 - 0.13 (ppm) (Pg. 12)			
Exposure duration:	85 mins pg 12			
Comments:	Analytic method: Standard size charcoal tubes were used with SKC model 222-351 pumps.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for processing as an intermediate, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty is addressed by the analytical method used. Variability is not addressed.	
Overall Quality Determination		Medium		

Study Citation:	Anonymous (1978). Suggested guidelines for minimizing employee exposure to ethylene dichloride (1,2-dichloroethane). American Industrial Hygiene Association Journal 39(9):A39.			
HERO ID:	5441840			
Conditions of Use:	PPE/Controls applicable to multiple COUs			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation			
Physical form:	Vapor			
Personal protective equipment:	Respirators, goggles, gloves. Respirators should only be used to control exposure during installation of engineering controls, when engineering controls are not feasible, maintenance, operations requiring entry into tanks/closed vessels, and emergencies. Only NIOSH respirators should be used, faceseal testing should be conducted.			
Engineering control:	Best control: Full enclosure with slight vacuum so leaks cause outside air to flow in, next most effective is LEV. Another option is employee isolation, using automated equipment controlled from a separate room.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for general exposure to chemical, applicable to all occupational exposure scenarios.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	N/A - controls/PPE info
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - controls/PPE info
Overall Quality Determination			High	

Study Citation:	Bertram, C. G. (1977). Minimizing emissions from vinyl chloride plants. Environmental Science & Technology 11(9):864.			
HERO ID:	5436554			
Conditions of Use:	Processing as an intermediate			
EXTRACTION				
Parameter	Data			
Worker activity description:	Loading of EDC.			
Engineering control:	Storage ventilation.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Low	Report does not specify the methods used.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for processing as an intermediate, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	N/A	N/A - no samples.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination		Low		

Study Citation:	Bowler, R. M., Gysens, S., Hartney, C. (2003). Neuropsychological effects of ethylene dichloride exposure. NeuroToxicology 24(4-5):553-562.			
HERO ID:	200241			
Conditions of Use:	Manufacture/processing/use - Clean up workers			
EXTRACTION				
Parameter	Data			
Worker activity description:	Chemical worker, operator, laborer, welder/pipefitter, security, supervisor, surveyor, scientist			
Exposure route:	Inhalation			
Number of workers:	137			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by sampling for multiple worker activities but uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	CDC, (2009). Fourth national report on human exposure to environmental chemicals.			
HERO ID:	664488			
Conditions of Use:	Various			
EXTRACTION				
Parameter	Data			
Worker activity description:	Workers involved in the production or use of these solvents may be exposed by inhalation or by dermal contact with the liquid solvents. . . Inhalation is the most common exposure route for the general population, including indoor sources from such as paints, adhesives, cleaning solutions, and aerosolized insecticide sprays; from industries producing these solvents; and from contaminated waste disposal sites (pg 488)			
Exposure route:	inhalation/dermal			
Physical form:	vapor/aerosol/liquid			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources (e.g., ASTDR, NTP, CDC).	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for various in-scope occupational scenarios.	
	Metric 4: Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	N/A	exposure route info	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	exposure route info	
Overall Quality Determination		High		

Study Citation:	Chao, K., Lai, J., Lin, H. C. (2007). Comparison of permeation resistance of protective gloves to organic solvents with ISO, ASTM and EN standard methods. Polymer Testing 26(8):1090-1099.			
HERO ID:	4699495			
Conditions of Use:	Use as a solvent			
EXTRACTION				
Parameter	Data			
Exposure route:	Dermal			
Dermal exposure data:	EDC/neoprene Permeability: 78 (ug/cm/min) (Pg. 1095)			
Personal protective equipment:	Nitrile gloves (Nitri-Solves 737, Best Co., Menlo, Ga)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data are from China, a non-OECD country.
	Metric 3:	Applicability	High	Data are for use as a solvent, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty is addressed by the analytical methods used. Variability is not addressed.
Overall Quality Determination			Medium	

Study Citation:	Cherrie, J. W. (1998). Selecting an adequate respiratory protective device: The choice between a respirator and breathing apparatus. Annals of Occupational Hygiene 42(2):91-95.			
HERO ID:	4930963			
Conditions of Use:	Unknown			
EXTRACTION				
Parameter	Data			
Personal protective equipment:	Various respirators with Protection factors given: Rubber half mask or filtering face respirator (4-20); Powered-filtering full facepiece respirator (4-40); Powered filtering hood or blouse (10-100); Full-face high efficiency dust respirator (40); Full-face canister gas respirator (20); Fresh air hose with full-facepiece (40); Continuous How air line full-mask (100); Positive pressure demand full-mask (2,000). (Pg. 2)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from the United Kingdom, an OECD country.
	Metric 3:	Applicability	Uninformative	Condition of use is unknown.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by testing different types of PPE, but uncertainty is not addressed.
Overall Quality Determination		Uninformative		

Study Citation:	Cohr, K. H. (1986). Uptake and distribution of common industrial solvents. Progress in Clinical and Biological Research 220:45-60.			
HERO ID:	61012			
Conditions of Use:	Dermal Exposure			
EXTRACTION				
Parameter	Data			
Exposure route:	dermal			
Physical form:	liquid			
Dermal exposure data:	modeled skin penetration rates for hydrocarbons (including chlorinated) in (nMoles/min x cm2) based on solubility in water mM) at 25 degrees C (p. 9-10)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality methods that are from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Denmark, an OECD country.
	Metric 3:	Applicability	Medium	Not specific to an in-scope OES, but generic dermal exposure data potentially applicable to multiple OESs. Information is not specific to DCE but in general for hydrocarbons
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old (1986) and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is described qualitatively (graphical).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Low	

Study Citation:	Dow Chemical, (1988). Mortality among Dow Chemical employees of a Texas operations per-tet manufacturing plant with cover letter dated 050389.			
HERO ID:	1441931			
Conditions of Use:	Processing as an intermediate			
EXTRACTION				
Parameter	Data			
Worker activity description:	Potential exposure to the feedstock, process chemicals, finished products and wastes have not been unique to any particular job classification. Anecdotal information indicated that before waste products were disposed of via a closed tank, they were stored in open dumpsters, which resulted in potential for airborne exposure. This practice of waste disposal of the heavy chlorinated organics was discontinued in the late 1960's. At that time a dosed holding tank was built to store by-products that were then pumped through a closed system to a tank to be shipped to a thermal oxidizer.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for processing as an intermediate, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	N/A	N/A - no sample data	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A - no quantitative data	
Overall Quality Determination		Medium		

Study Citation:	DuPont Haskell Lab, (2005). Ethylene dichloride: In vitro dermal absorption rate testing.			
HERO ID:	7490381			
Conditions of Use:	Dermal			
EXTRACTION				
Parameter	Data			
Exposure route:	Dermal			
Dermal exposure data:	Permeability coefficient: 9.69*10^-4 cm/h, short-term absorption rate (10 min): 1655.2 ug equiv/cm^2/hr, short-term absorption rate (60 min): 329.6 ug equiv/cm^2/hr			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from a frequently used source.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for dermal exposures, which can occur for multiple in-scope occupational scenarios.	
	Metric 4: Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (mean) but discrete samples not provided and distribution not fully characterized.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination		High		

Study Citation:	Fasano, W. J., McDougal, J. N. (2008). In vitro dermal absorption rate testing of certain chemicals of interest to the Occupational Safety and Health Administration: Summary and evaluation of USEPA’s mandated testing. Regulatory Toxicology and Pharmacology 51(2):181-194.		
HERO ID:	1618719		
Conditions of Use:	Dermal Exposure (all)		
EXTRACTION			
Parameter	Data		
Exposure route:	Dermal		
Physical form:	Liquid		
Dermal exposure data:	Steady-state dermal flux: 1197 ug/cm^2/h; Short term Absorption rates10 min f:1655, 60 min :329.6 ug/cm^2/h		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from protocol dictated by test order United States FR, April 26, 2004 (Volume 69, Number 80), pages 22402–22441.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Study was performed in the U.S.
	Metric 3: Applicability	High	Data are for dermal exposures, which can occur for multiple in-scope occupational scenarios.
	Metric 4: Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and conditions.
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (mean, max) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by sampling the steady-state flux along with 10-min and 60-min fluxes, and uncertainty is only briefly discussed with respect to proper vehicle selection for certain chemicals but that discussion is not applicable for DCE.
Overall Quality Determination		High	

Study Citation:	Frasch, H. F., Barbero, A. M. (2009). A paired comparison between human skin and hairless guinea pig skin in vitro permeability and lag time measurements for 6 industrial chemicals. Cutaneous and Ocular Toxicology 28(3):107-113.			
HERO ID:	734137			
Conditions of Use:	Dermal Exposure			
EXTRACTION				
Parameter	Data			
Exposure route:	Dermal			
Dermal exposure data:	Human- Permeability[mean]: 0.259 cm/h , lag time:0.12 h; Hairless guinea pig skin- Permeability[mean]: 0.295 cm/h , lag time:0.09 h			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessments uses techniques that thatare from frequently used sources and appear sound and does not indicate flaws.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The study was conducted in the United States.	
	Metric 3: Applicability	High	Data are for dermal exposures, which can occur for multiple in-scope occupational scenarios.	
	Metric 4: Temporal Representativeness	Medium	The report is more than 10 years but no more than 20 years.	
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized. Sample size is sufficiently representative.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability is addressed by discussing factors that influence permeability testing in the introduction, but limited discussion on variability and uncertainty of the permeability reported.	
Overall Quality Determination		High		

Study Citation:	Frasch, H. F., Barbero, A. M., Alachkar, H., Mcdougal, J. N. (2007). Skin penetration and lag times of neat and aqueous diethyl phthalate, 1,2-dichloroethane and naphthalene. Cutaneous and Ocular Toxicology 26(2):147-160.			
HERO ID:	1313327			
Conditions of Use:	Dermal Exposure (all)			
EXTRACTION				
Parameter	Data			
Exposure route:	Dermal			
Physical form:	liquid			
Dermal exposure data:	Skin permeability coefficient of hairless guinea pig skin: HF Frasch Lab: 5.01*10^-3 cm/h; JN McDougal lab: 3.07*10^-3 cm/h			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for dermal exposures, which can occur for multiple in-scope occupational scenarios.
	Metric 4:	Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (mean) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Variability addressed by comparing results from 2 different laboratories, uncertainty is addressed with the given standard deviation.
Overall Quality Determination			High	

Study Citation:	Gajjar, R. M., Kasting, G. B. (2014). Absorption of ethanol, acetone, benzene and 1,2-dichloroethane through human skin in vitro: a test of diffusion model predictions. Toxicology and Applied Pharmacology 281(1):109-117.			
HERO ID:	4141541			
Conditions of Use:	Dermal (Skin permeation study)			
EXTRACTION				
Parameter	Data			
Exposure route:	Dermal			
Dermal exposure data:	24 hour skin permeation: 14.2 - 84.4 (ug/cm^2).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for dermal exposures, which can occur for multiple in-scope occupational scenarios.	
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination		High		

Study Citation:	IPCS, (1995). 1,2-Dichloroethane (Second edition).			
HERO ID:	5175349			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Number of sites:	3			
Exposure route:	Inhalation			
Area sampling data:	2.8 - 6.8 (mg/m^3) (Pg. 18)			
Comments:	Number of sites comes from page 18, they took air measurements at 3 manufacturing sites in the UK			
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability		Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness		Metric 2: Geographic Scope	Medium	Data are from the U.K., an OECD country
		Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.
		Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
		Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity		Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty		Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	Moen, B. E. (1991). Work with chemicals on deck of Norwegian chemical tankers. International Archives of Occupational and Environmental Health 62(8):543-547.
HERO ID:	5467640
Conditions of Use:	Distribution in commerce

EXTRACTION	
Parameter	Data
Worker activity description:	Loading/unloading chemical tanks, checking tank levels and temperatures (Pg. 2)
Exposure route:	Inhalation
Personal protective equipment:	Respirators (Pg. 3)
Comments:	The seamen (n = 54) were asked how often they had used respiratory protective devices while handling volatile chemicals the previous year The captains were excluded from this question, as few of them had been working with chemicals the previous year Respiratory protective equipment was used "seldom or never" by 20 % of the seamen This equipment was used "sometimes" by 50 %. Only 30 % used it "regularly"

		EVALUATION	
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Low	Report does not specify the data used.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Norway, an OECD country.
	Metric 3: Applicability	High	Data are for distribution in commerce, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5: Sample Size	N/A	N/A - no sample data
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination	Low
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Study Citation:	(1965). 1,2-dichloroethane. (Ethylene chloride, ethylene dichloride, glycol dichloride). American Industrial Hygiene Association Journal 26(4):435-438.			
HERO ID:	5443990			
Conditions of Use:	Paints and coatings			
EXTRACTION				
Parameter	Data			
Worker activity description:	Four men suffered acute poisoning by inhalation while painting the interior of a container using a paint which included 1,2-dichloroethane as a solvent.			
Exposure route:	Inhalation			
Physical form:	Liquid			
Number of workers:	4			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Low	Report does not specify the methods used.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for Paints and coatings, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination		Low		

Study Citation:	NCBI, (2020). PubChem Annotation Record for 1,2-Dichloroethane.		
HERO ID:	9641339		
Conditions of Use:	All		
EXTRACTION			
Parameter	Data		
Worker activity description:	shoemaking, pipemaking, paint factory (page 4/79)		
Exposure route:	inhalation, dermal(page 37/79)		
Physical form:	liquid (page 3/79)		
Number of workers:	According to the 2016 TSCA Inventory Update Reporting data, 17 reporting facilities estimate the number of persons reasonablylikely to be exposed in the manufacturing, processing, or use of 1,2-dichloroethane in the United States may be as low as <10workers up to the range of 500-999 workers per plant; the data may be greatly underestimated due to confidential businessinformation (CBI) or unknown values. NIOSH (NOES Survey 1981-1983) has statistically estimated that 83,246 workers (33,361 of these are female) were potentially exposed to 1,2-dichloroethane in the US. (page 37/79)		
Personal protective equipment:	Wear positive pressure self-contained breathing apparatus when fighting fires involving this material (page 55/79).Filter respirator for organic gases and vapours adapted to the airborne concentration of the substance (page 59/79).		
Engineering control:	Warning signs should be placed on equipment, storage tanks, containers, and entrances to areas of use. Ensure adequate ventilation (page 56/79).		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (NIOSH, OSHA, published literature) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	High	This report is applicable to all COUs in scope.
	Metric 4: Temporal Representativeness	Medium	The data in the report ranges from 1976-2018.
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The report addressed variability by citing different studies. Uncertainty isn’t addressed.
Overall Quality Determination		High	

Study Citation:	NICNAS, (2013). Ethane, 1,2-dichloro-: Human health tier II assessment.			
HERO ID:	5155545			
Conditions of Use:	Paints and lacquers, adhesives, fertilizers			
EXTRACTION				
Parameter	Data			
Engineering control:	Recommended controls: Closed system operations or isolated operations; local exhaust ventilation (Pg. 12)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Australia, an OECD country.
	Metric 3:	Applicability	High	Data are for paints and coatings, adhesives and sealants, in-scope occupational scenarios.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by testing multiple products, uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	NIOSH, (2007). NIOSH pocket guide to chemical hazards.			
HERO ID:	192177			
Conditions of Use:	General Information			
EXTRACTION				
Parameter		Data		
Exposure route:		Toxicologically important entry routs (i.e., not potential routes associated with an exposure scenario): Inhalation, Ingestion, Skin Absorption, Skin and/or eye contact (pdf 167/454)		
Physical form:		Colorless liquid (pdf 167/454) This is not the physical form in the case of an occupational exposure scenario of the risk evaluation.		
Comments:		Synonyms/Trade Names: 1,2-Dichloroethane; Ethylene chloride; Glycol dichlorideNIOSH REL: TWA 1 ppm (4 mg/m3)ST 2 ppm (8 mg/m3) OSHA PEL: TWA 50 ppmC 100 ppm200 ppm [5-minute maximum peak in any 3 hours]		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability		Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.
Domain 2: Representativeness		Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evalu-ated.
		Metric 3: Applicability	N/A	The data source does not contain data that pertain to an occupational exposure scenario of the risk evaluation.
		Metric 4: Temporal Representativeness	Medium	The report is generally more than 10 years but no more than 20 years old.
		Metric 5: Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity		Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty		Metric 7: Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted
Overall Quality Determination			High	

Study Citation:	NIOSH, (1981). Permeation of protective garment materials by liquid halogenated ethanes and a polychlorinated biphenyl.			
HERO ID:	5476924			
Conditions of Use:	Intermediate in all other basic organic chemical manufacturing			
EXTRACTION				
Parameter	Data			
Exposure route:	Dermal			
Personal protective equipment:	Permeability study for multiple glove types on PDF Pg. 21. Protective garment material (gloves, aprons, etc.) constructed from butyl rubber or Viton elastomer afford the best protection, but in cases of limited contact butyl-coated nylon, neoprene rubber latex, or poly(vinyl alcohol) will afford some protection.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for processing as an intermediate, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed by multiple testing iterations. Variability addressed by multiple PPE types tested.
Overall Quality Determination			Medium	

Study Citation:	NIOSH, (2019). NIOSH pocket guide to chemical hazards: Ethylene dichloride.			
HERO ID:	7310492			
Conditions of Use:	All conditions of use			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation, skin absorption.			
Physical form:	Colorless liquid.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality [data/techniques/methods] from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for all conditions of use.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	NIOSH, (1978). Revised recommended standard: Occupational exposure to ethylene dichloride (1,2-dichloroethane).			
HERO ID:	7310523			
Conditions of Use:	Manufacture, processing, use			
EXTRACTION				
Parameter	Data			
Worker activity description:	Storing, handling, packaging, transporting, and disposing of 1,2-dichloroethane.			
Exposure route:	Dermal, inhalation			
Physical form:	Liquid			
Personal protective equipment:	Full-body protection with appropriate head covering and air supply shall be used in weighing and charging operations in which there is occupational exposure to ethylene dichloride.			
Engineering control:	The most effective control measure is enclosure of unit operations and processes. For small operations, glove boxes or laboratory hoods may constitute sufficient enclosure. Local exhaust ventilation may also be effective when used at the source of ethylene dichloride emission.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for general exposure to chemical, applicable to all occupational exposure scenarios.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	NIOSH, (1978). Current intelligence bulletin 25: Ethylene dichloride (1,2-dichloroethane).
HERO ID:	7310531
Conditions of Use:	General article that reports results from a NIOSH survey, numerous exposures occurred in the following industries: chemical and allied products, printing and publishing, electrical equipment and supplies, wholesale and retail trade, food and kindred products, leather and leather products, and machinery.

EXTRACTION

Parameter	Data
Exposure route:	inhalation
Physical form:	vapor
Exposure duration:	up to 10 hours per day
Exposure frequency:	40 hours per week
Number of workers:	2 million,
Personal protective equipment:	The least preferred method is the use of personal protective equipment. This equipment, which may include respirators, goggles, gloves, etc., should not be used as the only means to prevent or minimize exposure during routine operations. Exposure to ethylene dichloride should not be controlled with the use of respirators except:- During the time period necessary to install or implement engineering or work practice controls; or- In work situations in which engineering and work practice controls are technically not feasible; or- For operations which require entry into tanks or closed vessels; or- In emergencies. Only respirators approved by the National Institute for Occupational Safety and Health (NIOSH) should be used. Refer to NIOSH Certified Equipment, December 15, 1975, NIOSH publication #76-145 and Cumulative Supplement June 1977, NIOSH Certified Equipment, NIOSH publication #77-195. The use of faceseal coverlets or socks with any respirator voids NIOSH approvals.
Engineering control:	The most effective control of ethylene dichloride is at the source of contamination by enclosure of the operation and/or local exhaust ventilation. If feasible, the process or operation should be enclosed with a slight vacuum so that any leakage will result in the flow of external air into the enclosure. The next most effective means of control would be a well designed local exhaust ventilation system that physically encloses the process as much as possible, with sufficient capture velocity to keep the contaminant from entering the work atmosphere.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	NIOSH Study
Domain 2: Representativeness	Metric 2: Geographic Scope	High	US data
	Metric 3: Applicability	Medium	Seems appropriate for a wide range of industries.- data on specific industries is not provided.
	Metric 4: Temporal Representativeness	Low	More than 20 years old data. April 19, 1978.
	Metric 5: Sample Size	Low	Qualitative information provided
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	NIOSH study with references
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The report provides only limited discussion of the variability and uncertainty in the results.

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Study Citation:		NIOSH, (1978). Current intelligence bulletin 25: Ethylene dichloride (1,2-dichloroethane).	
HERO ID:		7310531	
Conditions of Use:		General article that reports results from a NIOSH survey, numerous exposures occurred in the following industries: chemical and allied products, printing and publishing, electrical equipment and supplies, wholesale and retail trade, food and kindred products, leather and leather products, and machinery.	
Domain	Metric	EVALUATION Rating	Comments
Overall Quality Determination		Medium	

Study Citation:	NIOSH, (1988). Occupational safety and health guideline for ethylene dichloride.			
HERO ID:	7325697			
Conditions of Use:	All			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation and dermal			
Physical form:	liquid and vapor			
Personal protective equipment:	CPC gloves (pg 3); respirators when controls are not feasible, being installed, or during emergencies, complete respiratory protection program complying with OSHA Safety and Health Standards 29 CFR 1920.134 (pg 4)			
Engineering control:	process enclosure, local exhaust ventilation, PPE			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for handling 12-DCA in general
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	PPE info
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	PPE info
Overall Quality Determination			High	

Study Citation:	Olexsey, R. A., Blaney, B. L., Turner, R. J., Brown, L. M. (1988). Technologies for the recovery of solvents from hazardous wastes. Hazardous Waste and Hazardous Materials 5(4):365-377.			
HERO ID:	5065504			
Conditions of Use:	Manufacturing/Processing			
EXTRACTION				
Parameter	Data			
Engineering control:	Steam stripping (pg 12)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources (EPA source).
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for MFG and processing as a reactant, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	N/A - controls info
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	n/a - controls info
Overall Quality Determination			High	

Study Citation:	Ott, M. G., Teta, M. J., Greenberg, H. L. (1989). Assessment of exposure to chemicals in a complex work environment. American Journal of Industrial Medicine 16(6):617-630.
HERO ID:	104202
Conditions of Use:	Manufacture

EXTRACTION	
Parameter	Data
Number of sites:	3
Number of workers:	29,139 men and 4,579 across 3 sites between 1940-1978 in general; 44 specific to ethylene dichloride work areas

EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data that are from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Low	Report is unclear on the condition of use, however, it does occur at industrial facilities; specifies company; and time period. Based on company, assumed OES is Manufacturing.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is described qualitatively.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The report provides only limited discussion of the variability and uncertainty in the results.

Overall Quality Determination	Low
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Study Citation:	Schenk, L., Rauma, M., Fransson, M. N., Johanson, G. (2018). Percutaneous absorption of thirty-eight organic solvents in vitro using pig skin. PLoS ONE 13(10):e0205458.			
HERO ID:	4940676			
Conditions of Use:	Dermal Exposure (all)			
EXTRACTION				
Parameter	Data			
Exposure route:	Dermal			
Dermal exposure data:	Permeability coefficient in pig skin: 1.09*10^-3 cm/h			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Sweden, an OECD country.
	Metric 3:	Applicability	High	Data are for dermal exposures, which can occur for multiple in-scope occupational scenarios.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (mean, standard error, and coefficient of variation) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			High	

Study Citation:		Snedecor, G., Hickman, J. C., Mertens, J. A. (2004). Chloroethylenes.		
HERO ID:		3827414		
Conditions of Use:		All		
EXTRACTION				
Parameter		Data		
Exposure route:		Section 1.5, pg. 5/26, describes the effects of dermal, inhalation, and eye exposure.		
Physical form:		"a colorless, volatile liquid with a pleasant odor, stable at ordinary temperatures. It is miscible with other chlorinated solvents and soluble in common organic solvents as well as having high solvency for fats, greases, and waxes."pg. 1/26		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability		Metric 1: Methodology	Medium	The assessment or report uses high quality data and/or techniques or sound methods that are not from a frequently used source and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness		Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
		Metric 3: Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation.
		Metric 4: Temporal Representativeness	Low	Data cited in report is mostly over 20 years old
		Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity		Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty		Metric 7: Metadata Completeness	Medium	The report provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination			Medium	

Study Citation:	Troisi, F., Cavallazzi, D. (1961). Fatal poisoning from inhalation of dichloroethane vapors. La Medicina del Lavoro 52:612-618.			
HERO ID:	17899			
Conditions of Use:	Solvent Uses			
EXTRACTION				
Parameter	Data			
Worker activity description:	Worker was exposed during unloading the reactor boiler contents into centrifuges, and unloading the crude acid from the centrifuges. Other examples:washing yarn with solvent; spray painting the walls of a vat with dichloroethane based products; cleaning the cyclinder of typographic machines;			
Exposure route:	Inhalation			
Physical form:	Vapor			
Personal protective equipment:	mechanical removal of vapors and neutralizing filter masks, gloves, and rubber aprons.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for processing as an intermediate, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	N/A	No monitoring data extracted; only worker descriptions and site-specific PPE.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability and uncertainty addressed by discussing where potential exposures to worker may have occurred.	
Overall Quality Determination		Medium		

Study Citation:	U.S. BLS, (2023). U.S. Census Bureau of Labor Statistics Data from 2021.			
HERO ID:	11138808			
Conditions of Use:	all			
EXTRACTION				
Parameter	Data			
Number of workers:	9356 individual OCC codes by NAICS groupings are included in the spreadsheet for annual and hourly by percentile			
Comments:	These census employment data are of limited value on their own but could be combined with exposure data provided by NAICS code to estimate exposed population			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	US Census
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	USA
	Metric 3:	Applicability	High	All employment sectors
	Metric 4:	Temporal Representativeness	Low	The year which the data represent is not noted.
	Metric 5:	Sample Size	High	hourly and annual data are provided by mean, median, and percentiles
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Additional information is needed to fully understand the data fields included in this spreadsheet
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	hourly and annual data are provided by percentiles which could be used to estimate variance and uncertainty.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2020). 2020 CDR: Commercial and consumer use.			
HERO ID:	10366189			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Number of workers:	range from less than 10 to 999 per facility (cell BE)note 5 facilities did not provide any data/claimed CBI.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	EPA 2020 CDR	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	USA	
	Metric 3: Applicability	High	Plastics manufacturing	
	Metric 4: Temporal Representativeness	High	data represents 2019	
	Metric 5: Sample Size	High	individual records are provided to allow for the development of appropriate statistics	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	EPA 2020 CDR	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	detailed data are provided that can be used to assess variability and uncertainty.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (1984). Draft criteria document for 1,2-dichloroethane.		
HERO ID:	18226		
Conditions of Use:	Unknown		
EXTRACTION			
Parameter	Data		
Exposure route:	Inhalation		
Personal sampling data:	0.016 (ppm) (Pg. 114)		
Comments:	Analytic method: Ginzburg’s method.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Low	There is no information provided on the one data point
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	There is one data mentioned and no information where it came from. Maybe U.S.
	Metric 3: Applicability	Uninformative	Data are for an unknown occupational scenario.
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Uninformative	

Study Citation:	UNEP, (1988). News about chemicals. International Register of Potentially Toxic Chemicals Bulletin 9(1):19.			
HERO ID:	5436106			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Worker activity description:	Production facility workers			
Area sampling data:	40 - 800 (mg/m^3) (Pg. 16)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from worldwide.
	Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	VI, (2020). Comment submitted by Vinyl Institute regarding EDC impurities.			
HERO ID:	11182965			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Physical form:	Liquid [PDF Pg. 2 of 6]			
Personal protective equipment:	breathing air and line break suits [PDF Pg. 5 of 6, see page for additional description]			
Comments:	No engineering controls given. No release quantities given.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	N/A	N/A- PPE and physical form.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A- PPE and physical form.	
Overall Quality Determination		High		

Study Citation:	VI, (2026). Vinyl Institute comments on 1,2-dichloroethane regarding working year data and inhalation monitoring data.			
HERO ID:	13245902			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Exposure frequency:	Demographic data provided in the VI Test Order response was summarized: Manufacturing and processing as a reactant: 8.9 yr (mean), 33 yr (max); Manufacturing as a byproduct: 10.6 yr (mean), 40 yr (max)			
Comments:	Demographic data provided length of service in years			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Low	Techniques and methods used to collect demographic data were not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S. and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	Data are for manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Monitoring data are no more than 10 years old (2026).
	Metric 5:	Sample Size	Low	Sample distribution characterized by limited statistics (mean and maximum) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Underlying methods, data sources, and assumptions not fully documented or transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by sample concentrations compiled from multiple sources/facilities, but uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	Arthur D. Little Inc, (1987). Evaluation of chemical air emissions from the Bristol plant production facilities, Rohm and Haas, Delaware Valley, Inc (final report) with attachments and cover letter dated 08/10/1989.			
HERO ID:	1481094			
Conditions of Use:	Processing- Chemical and Plastic Manufacturing			
EXTRACTION				
Parameter	Data			
Release or emission factors:	Media: water; Non-detect (Pg. 122)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Methodology is known and expected to be accurate and cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data is for an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Release media provided but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty is addressed by QC of samples and multiple samples being taken. Variability is not addressed.
Overall Quality Determination		Medium		

Study Citation:	AS., COWI (2018). Screening programme 2017: Suspected PBT compounds.		
HERO ID:	7303021		
Conditions of Use:	Disposal		
EXTRACTION			
Parameter	Data		
Description of release source:	Wastewater from WWTPs		
Release or emission factors:	Wastewater concentrations of 1,2-DCA: <0.20 ug/L		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Norway, an OECD country.
	Metric 3: Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Data are based on current industry conditions and data no more than 10 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (mean) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Release media and release frequency provided but missing waste treatment methods and release quantity.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by sampling multiple WWTPs, but uncertainty is not addressed.
Overall Quality Determination		Medium	

Study Citation: ATSDR, (1996). Toxicological profile for 1,2-dichloroethene.
HERO ID: 723873
Conditions of Use: All possible sources

EXTRACTION

Parameter	Data
Description of release source:	1,2-Dichloroethene may be released to the atmosphere in emissions from production facilities, contaminated wastewaters, contaminated waste disposal sites, and the pyrolysis and combustion of polyvinyl chloride and some vinyl copolymers. It may also be released during its use as a solvent and extractant, in organic synthesis, and in the manufacture of perfumes, lacquers, and thermoplastics.
Release quantity:	Not enough data are currently available to estimate the total amount of 1,2-dichloroethene released to the atmosphere. According to the 1995 Toxics Release Inventory (TRI), an estimated total of 29,478 pounds of 1,2-dichloroethene representing >99.9% of the total environmental release was discharged to air from manufacturing and processing facilities in the United States in 1993. The TRI data should be used with caution since only certain types of facilities are required to report. Therefore, this is not an exhaustive list (Table 5-1 - will not reproduce here as current TRI data)
Waste treatment methods and pollution control:	1,2-Dichloroethene may be released from industries in wastewater streams; however, these compounds can be removed from wastewater by air stripping. Improved wastewater treatment methods at publicly owned treatment works (POTWs) now use air stripping processes to remove most 1,2-dichloroethene and other volatile organic compounds (VOCs) from final effluents and deposit them in sludges or release them in air emissions.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	The release data methodology is known (TRI) or expected to be accurate but acknowledges that the data may not cover all release sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	US
	Metric 3: Applicability	High	The release data are for an occupational scenario (all possible sources) within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	more than 20 years old
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The release data study provides only limited discussion of the variability in the determinants of release.

Overall Quality Determination**Medium**

Study Citation:	Chung, M. Y., Beene, M., Ashkan, S., Krauter, C., Hasson, A. S. (2010). Evaluation of non-enteric sources of non-methane volatile organic compound (NMVOC) emissions from dairies. Atmospheric Environment 44(6):786-794.			
HERO ID:	379998			
Conditions of Use:	Dairy Factory			
EXTRACTION				
Parameter	Data			
Description of release source:	TMR; Silage; Flush Lane; Lagoon; Open lot; Bedding			
Release quantity:	0 - 7.3*10^-10 (g/m^2 h) (Page 790)			
Comments:	Releases estimate with Isolation flux chambers and SUMA cannisters (Page 787).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Uninformative	Data are for dairy farms which is not in-scope or similar to an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	Data is more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release media and release frequency provided but missing waste treatment method.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by sampling multiple sources of emission but uncertainty is not addressed.
Overall Quality Determination		Uninformative		

Study Citation:	Class, T., Ballschmiter, K. (1987). Global baseline pollution studies: X. Atmospheric halocarbons: Global budget estimations for tetrachloroethene, 1,2-dichloroethane, 1,1,1,2-tetrachloroethane, hexachloroethane and hexachlorobutadiene. Estimation of the hydroxyl radical concentrations in the troposphere of the northern and southern hemisphere. Fresenius’ Journal of Analytical Chemistry 327(2):198-204.			
HERO ID:	1441652			
Conditions of Use:	Unknown			
EXTRACTION				
Parameter	Data			
Description of release source:	vinyl industry and traffic			
Release quantity:	400-500 (ktons/year) in the northern hemisphere			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are global.
	Metric 3:	Applicability	Uninformative	The release data are unknown
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Release media provided but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Uninformative	

Study Citation:	Clement Associates., Inc. (1989). Human health risk assessment for the Ciba-Geigy St Gabriel, LA incineration project with cover letter dated 042789.
HERO ID:	890000189:#86-890000189.
Conditions of Use:	Disposal

EXTRACTION

Parameter	Data
Release quantity:	Rotary incinerator: 4.93×10^{-6} (g/sec) (Pg. 288); Liquid incinerator: 1.08×10^{-5} (g/sec)
Waste treatment methods and pollution control:	Rotary kiln incinerator; liquid incinerator

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (mean) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Release media and release frequency provided but missing release estimation method.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by two types of incineration being tested but uncertainty is not addressed.

Overall Quality Determination**Medium**

Study Citation:	Cowfer, J. A., Gorenssek, M. B. (2006). Vinyl chloride. :1-31.			
HERO ID:	6301240			
Conditions of Use:	Procesing as a reactant: Intermediate in Plastic material manufacture			
EXTRACTION				
Parameter	Data			
Release or emission factors:	Vent streamsAir Based Balanced Ethylene processDirect Chlorination 0.0016Oxychlorination 0.0017Distillation column 0.0045			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Low	The release data methodology is not specified.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	US	
	Metric 3: Applicability	High	The release data are for an occupational scenario (Vinyl Chloride production) within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Medium	2006 - more than 10 but less than 20 years	
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Release data include release media but no other metadata.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The release data study does not address variability or uncertainty.	
Overall Quality Determination		Low		

Study Citation:	Demir, S., Saral, A., Kuzu, S. L. (2012). Assessment of levels and associated risks of exposure to VOCs released from MSW landfill sites. Fresenius Environmental Bulletin 21(3A):781-788.
HERO ID:	2099904
Conditions of Use:	Disposal

EXTRACTION

Parameter	Data
Description of release source:	Landfill
Release quantity:	Release estimated via ISCST3. Ambient air concentrations of 1,2-dichloroethane emitted from the landfill site were calculated over six averaging periods. Real case model results and worst case scenario-based model results were obtained. Data can be found in table 3 and figure 2.
Release or emission factors:	2.892*10 ⁻³ (g/sec) (Pg. 3)
Waste treatment methods and pollution control:	Landfill disposal

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Turkey, an OECD country.
	Metric 3: Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Data are no more than 10 years old.
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All metadata provided.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination**Medium**

Study Citation:	Dempsey, C. R. (1993). A comparison of organic emissions from hazardous waste incinerators versus the 1990 toxics release inventory air releases. Journal of the Air and Waste Management Association 43(10):1374-1379.			
HERO ID:	659922			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	Hazardous Waste Incinerators			
Release quantity:	6.2 tpy for "reasonable worst case HWI Stack Emissions"; 3,311 tpy for TRI (Pg. 3)			
Comments:	Media: air			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (95th percentile given) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release media and release frequency provided but missing release estimation method, waste treatment method.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by comparing the study results to TRI results, but uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	Earhart, J. P., King, C. J., Prausnitz, J. M., Won, K. W. (1976). Extraction of Chemical Pollutants from Industrial Wastewaters with Volatile Solvents.
HERO ID:	6027211
Conditions of Use:	Disposal

EXTRACTION

Parameter	Data
Description of release source:	EDC oxychlorination plant wastewater effluent
Release or emission factors:	Wastewater: 1500 - 3360 (ppm) (Pg. 90)
Waste treatment methods and pollution control:	Steam stripping followed by distillation (Pg. 62); 80.2 - 83.0% (Pg. 165); >99% (Pg. 250)

EVALUATION

Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	The release data methodology is known or expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (range) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Release media provided but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by different efficiencies being tested for different systems, but uncertainty is not addressed.

Overall Quality Determination**Medium**

Study Citation:	Earthjustice, (2020). Exhibit 1 to comments of rubbertown emergency action et al., re: TSCA risk evaluations for high-priority substances and substances undergoing manufacturer-requested risk evaluations.
HERO ID:	10385015
Conditions of Use:	Disposal

EXTRACTION

Parameter	Data
Release quantity:	Greater Houston, TX Area [PDF Pg. 17]Releases: 649,523 lbsWaste Transfers Sent Off-Site: 13,390,546 lbsWaste Received: 19,172,628 lbsPort Arthur, TX and Surrounding Area [PDF Pg. 20]Releases: 1,667 lbsWaste Transfers Sent Off-Site: 284 lbsWaste Received: 2,308,136 lbsMossville, LA Area [PDF Pg. 22]Releases: 288,060 lbsWaste Transfers Sent Off-Site: 1,462,513 lbsWaste Received: 3,489 lbsCommunities in Cancer Alley, LA [PDF Pg. 24]Releases: 1,149,525 lbsWaste Transfers Sent Off-Site: 12,387,102 lbsWaste Received: 1,723 lbsVeolia Es (Port Arthur, TX) [PDF Pg. 57]Air: 1,667 lbsIncoming Waste Transfer: 2,308,136 lbsOxy Vinyls (LaPorte, TX) [PDF Pg. 74]Air: 113,332 lbsWater: 48 lbsOffsite Transfer: 7,473,532 lbsFormosa Plastics (Point Comfort, TX) [PDF Pg. 74]Air: 100,296 lbsWater: 254 lbsOffsite Transfer: 3,708,201 lbsOlin (Blue Cube) (Freeport, TX) [PDF Pg. 74]Air: 62,239 lbsWater: 7 lbsLand: 2 lbsOffsite Transfer: 1,862,644 lbsOxy Vinyls VCM Plant (Deer Park, TX) [PDF Pg. 74]Air: 88,470 lbsIncoming Waste Transfer: 8,501,754 lbsOffsite Transfer: 143,091 lbsTexas Molecular (Deer Park, TX) [PDF Pg. 74]Air: 700 lbsUnderground Injection Wells: 208,387 lbsIncoming Waste Transfer: 194,163 lbsOffsite Transfer: 20,438 lbsDow Chemical (Freeport, TX) [PDF Pg. 74]Air: 59,234 lbsWater: 11,075 lbsLand: 128 lbsIncoming Waste Transfers: 1,536,898 lbsOffsite Transfer: 83,786 lbsTexas Barge & Boat Co (Freeport, TX) [PDF Pg. 74]Air: 1,619 lbsOffsite Transfer: 69,551 lbsClean Harbors (LaPorte, TX) [PDF Pg. 74]Air: 224 lbsIncoming Waste Transfers: 8,923,300 lbsOffsite Transfer: 25,507 lbsHuntsman (Freeport, TX) [PDF Pg. 74]Air: 1,861 lbsWater: 36 lbsOffsite Transfer: 1,747 lbsEthyl Corp (Pasadena, TX)Air: 559 lbsOffsite Transfer: 2,049 lbsPasadena Refining System (Pasadena, TX) [PDF Pg. 74]Air: 871 lbsWaste Management Coastal Plains: (Alvin, TX) [PDF Pg. 74]Land: 120 lbsIncoming Waste Transfer: 120 lbsSeabreeze Environmental Landfill (Angleton, TX) [PDF Pg. 74]Land: 46.40 lbsIncoming Waste Transfer: 46.40 lbsAllied Waste (Houston, TX) [PDF Pg. 74]Land: 10 lbsIncoming Waste Transfer: 10 lbsRepublic Services Blue Ridge Landfill (Fresno, TX) [PDF Pg. 74]Land: 3.46 lbsIncoming Waste Transfer: 3.46 lbsAllied Waste Gulf Landfill (Anahuac, TX) [PDF Pg. 74]Land: 1.07 lbsIncoming Waste Transfer: 1.07 lbsLonestar Ecology (Pasadena, TX) [PDF Pg. 74]Incoming Waste Transfer: 10,000 lbsShell Chemical LP (Deer Park, TX) [PDF Pg. 74]Incoming Waste Transfer: 4,818 lbsChemsep Bayport (Pasadena, TX) [PDF Pg. 74]Incoming Waste Transfer: 1,417 lbsUS Ecology (Robstown, TX) [PDF Pg. 74]Incoming Waste Transfer: 93 lbsClean Harbors San Leon (San Leon, TX) [PDF Pg. 74]Incoming Waste Transfer: 4.41 lbsWestlake (Lake Charles, LA) [PDF Pg. 87]Air: 282,781 lbsWater: 2,033 lbsIncoming Waste Transfer: 66 lbsOffsite Transfer: 1,462,513 lbsChemical Waste Management (Sulphur, LA) [PDF Pg. 87]Land: 3,246 lbsIncoming Waste Transfer: 3,246 lbsSasol (Westlake, LA) [PDF Pg. 87]Incoming Waste Transfer: 177 lbsFormosa Plastics (Baton Rouge, LA) [PDF Pg. 101]Air: 260,035 lbsWater: 93 lbsOffsite Transfer: 7,293,900 lbsOccidental Chemical (Convent, LA) [PDF Pg. 101]Air: 48,308 lbsWater: 11.20 lbsLand: 517 lbsOffsite Transfer: 2,717,289 lbsHoneywell International (Baton Rouge, LA) [PDF Pg. 101]Air: 749 lbsWater: 336 lbsOffsite Transfer: 1,118,119 lbsOlin (Plaquemine, LA) [PDF Pg. 101]Air: 35,618 lbsOffsite Transfer: 587,020 lbsWestlake Vinyls Co (Geismar, LA) [PDF Pg. 101]Air: 30,900 lbsWater: 164 lbsOffsite Transfer: 215,248 lbsDow Chemical (Plaquemine, LA) [PDF Pg. 101]Air: 23,203 lbsWater: 914 lbsOffsite Transfer: 421,258 lbsShintech (Shin-Etsu) (Plaquemine, LA) [PDF Pg. 101]Air: 169,389 lbsOffsite Transfer: 367 lbsOccidental Chemical (Geismar, LA) [PDF Pg. 101]Air: 151,986 lbsWater: 146 lbsLand: 32.30 lbsOffsite Transfer: 12,477 lbsWestlake (Formerly Axiall) (Plaquemine, LA) [PDF Pg. 101]Air: 116,525 lbsWater: 24 lbsOffsite Transfer: 21,031 lbsDow Chemical (Plaincourtville, LA) [PDF Pg. 101]Air: 313 lbsOffsite Transfer: 381 lbsUnion Carbide Corp. (Hahnville, LA) [PDF Pg. 101]Air: 262 lbsOffsite Transfer: 11.70 lbsClean Harbors (Baton Rouge, LA) [PDF Pg. 101]Incoming Waste Transfer: 1,049 lbsSolvay USA (formerly Rhodia Inc) Unit #6 (Baton Rouge, LA) [PDF Pg. 101]Incoming Waste Transfer: 674 lbs Underground injection wells [PDF Pg. 74]
Waste treatment methods and pollution control:	

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Low Methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High Data are from the U.S.

Continued on next page ...

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Study Citation:	Earthjustice, (2020). Exhibit 1 to comments of rubbertown emergency action et al., re: TSCA risk evaluations for high-priority substances and substances undergoing manufacturer-requested risk evaluations.
HERO ID:	10385015
Conditions of Use:	Disposal

		EVALUATION		
Domain	Metric	Rating	Comments	
	Metric 3:	Applicability	High	Data are for Disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Data are no more than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Medium	Release media provided but no other metadata.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Medium	Variability addressed by data from multiple sites, but uncertainty is not addressed.

Overall Quality Determination**High**

Study Citation:	Earthjustice, (2019). Ethylene dichloride (EDC): Technical report on the conditions of use.			
HERO ID:	11182960			
Conditions of Use:	All conditions of use			
EXTRACTION				
Parameter	Data			
Description of release source:	Descriptions of releases are included on page 9 to 13 including sections describing releases from manufacturing/processing, storage and transportation, from products, and disposal [Pg 9 until 13 of 23]			
Release quantity:	"On average, between 2012 and 2018, U.S. facilities reported releasing 395,399 pounds of EDC into the air each year. They also released, on average, 3,493 pounds of EDC into water, 10,970 pounds onto land, and 30,802 pounds into underground injection wells." [PDF Pg. 8 of 23]"The chemical and waste management industry transferred, on average, 4,435,434 pounds per year of EDC waste to other locations. These incinerators, cement kilns, landfills, transferstations, fuel blending facilities, underground injection wells, and wastewater treatment plants, are primarily located in the Gulf Coast and Midwestern Regions of the U.S." [PDF Pg. 9 of 23]*Additional facility-specific release values are presented in Table 2 on PDF Pg. 14-19.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	from usa	
	Metric 3: Applicability	High	chemical specific and relevant to many COUs	
	Metric 4: Temporal Representativeness	Medium	report from 2019, data may be more than 10 years old	
	Metric 5: Sample Size	High	variety of site releases reported	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Release data include all associated metadata, including release media; process, unit operation, or activity that is the source of the release; and release frequency (though may not have release frequency?)	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	There is some discussion about variability and determinants of release	
Overall Quality Determination		High		

Study Citation:	Ecology and Environment, (1992). Site investigation and evaluation of remedial measures report Howard Hughes properties plant site, Los Angeles, California.
HERO ID:	6311590
Conditions of Use:	Aircraft component production/R&D/testing (pg 22) [cleaning and degreasing solvents, pg 88];

EXTRACTION

Parameter	Data
Description of release source:	"Fire training burn pit [west end of property, pg 81], salvage yard underground sumps [west, east and northeast of building 23, pg 76-80], former drum storage area [west of building 947, pg 81], storm drain discharge area, building 12 clarifiers and test sump, building 15 utility trenches and sump [and clarifier, pg 75], building 14 clarifiers, Building 11 tanks [underground tanks west of building 11, pg 78], building 35 organics sump, underground tank south of building 5, underground tanks north of building 12, clarifier south of building 21 (pg 24-25); southwest corner of building 6 (liquid waste neutralization pit), west of building 11 (oil and grease pit area), area north of building 31 and south of runway (engine cleaning pits area), Building 32 Surface Runoff Area, Purged fuel storage area (west of building 45), Temporary drum storage area (building 29), Test site 2 and 3 (pg 73-81) "
Release or emission factors:	pg 98-267 has soil/groundwater sampling results, showing concentrations from 60ppb - 26000ppb; more groundwater/soil sampling results presented throughout, e.g. App. B
Waste treatment methods and pollution control:	"6-well extraction system" to pump up and treat contaminated groundwater at site via air stripping (pg 22); more detail pg 26-7; pg 379-80 presents data on influent and effluent concentrations for groundwater air stripping, can likely be adapted for other COUs (since groundwater treatment is out of scope); pg 381 says 99.9% effective
Comments:	media: land (soil/groundwater); fugitive air (volatilization)

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources (TSCA submission; references EPA analytical methods for soil/groundwater sampling analysis).
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	High	Data are for cleaning and degreasing solvents, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by considering multiple remediation/pollution prevention methods for each release source, but uncertainty is not addressed.

Overall Quality Determination**High**

Study Citation:	ENSR, (1991). AB 2588 health risk assessments: Corrected and alternative emissions cases for the Taft Area Oil Fields - Taft, California with attachments and cover letter dated 090591.			
HERO ID:	1481750			
Conditions of Use:	Petroleum production			
EXTRACTION				
Parameter	Data			
Description of release source:	Fug: Well heads			
Release quantity:	0.0000026022 - 0.0000153765 (lbs./year) (Pg. 251-403)			
Release or emission factors:	0.0000002366 (lbs./unit) (Pg. 279)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Methodology is known and expected to be accurate and cover all release sources at the site.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for petroleum production, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Data are greater than 20 years old.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Release media and release frequency provided but missing release estimation method, number of sites, release days per year and waste treatment method.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by multiple release sources being tested, but uncertainty is not addressed.	
Overall Quality Determination		Medium		

Study Citation:	ENSR, (1991). Ab 2588 Health Risk Assessment for Kern River and Racetrack Oil Fields, Bakersfield, California with attachments and cover letter dated 090591.			
HERO ID:	1481756			
Conditions of Use:	Petrochemical production			
EXTRACTION				
Parameter	Data			
Description of release source:	Typical oil and gas production field sources: Tanks, internal combustion engines, steam generators, sumps, and production activity fugitive emissions (Pg. 18)			
Release quantity:	Racetrack Hill: 0.00066601 (kg/year) (Pg. 44); Kern River: 0.01594175 (kg/year) (Pg. 55)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Methodology is known and expected to be accurate and cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release media and release frequency provided but missing release estimation method and waste treatment method.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by analyzing multiple sites, but uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	ENSR, (1991). Acute ISC input data-full grid & AB 2588 health risk assessments: Corrected & alternative emissions cases for the Cymric area oil fields			
HERO ID:	McKittrick, California with letter 090591.			
Conditions of Use:	1481763			
	Petrochemical production			
EXTRACTION				
Parameter	Data			
Release quantity:	0 - 2.234*10^-10 (kg/year) (Pg. 1316)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Methodology is known and expected to be accurate and cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for petrochemical production, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release media and release frequency provided but missing release estimation method and waste treatment method.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by analyzing multiple sites, but uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	Haas,, R.a. (1981). DCE, DCP and DCEE discharge data for Sept. 1981 from the Rohm and Haas Philadelphia plant’s discharges into the city sewer and 1,2-dichloropropane analysis with cover letter.			
HERO ID:	2803584			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter		Data		
Description of release source:		Rohm and Haas Philadelphia Plant aqueous discharge		
Release quantity:		August: 60 - 1110 lbs/day September: 30 - 2010 lbs/day October: 18 - 2160 lbs/day		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release media and release frequency provided but missing waste treatment methods.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by giving emissions from multiple days and months, but uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	Hart, J. R. (1994). Comparison of emissions from burning hazardous waste in a dry-process cement kiln with emission from burning conventional fossil fuels. Hazardous Waste and Hazardous Materials 11(1):193-199.
HERO ID:	658817
Conditions of Use:	Disposal - Burning Hazardous Waste

EXTRACTION

Parameter	Data
Description of release source:	Hazardous waste as fuel for Cement Kiln
Release or emission factors:	Media: air; Lists 1,2-DCA as a compound analyzed but not detected in the exhaust gas (p. 6). LOD or initial concentration of 1,2-DCA in waste stream unknown.
Waste treatment methods and pollution control:	Presents some efficiencies for other VOCs (p. 4)

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Low	Data are greater than 20 years old (1994)
	Metric 5: Sample Size	Low	Sample details not provided - report only indicated that 1,2-DCA not detected in waste stream
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Release media provided, but no other metadata provided: LOD, initial amount of 1,2-DCA in waste stream
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination**Low**

Study Citation:	Hsu, Y. C., Chen, S. K., Tsai, J. H., Chiang, H. L. (2007). Determination of volatile organic profiles and photochemical potentials from chemical manufacture process vents. Journal of the Air and Waste Management Association 57(6):698-704.
HERO ID:	608305
Conditions of Use:	Processing as a reactant

EXTRACTION

Parameter	Data
Description of release source:	General chemical manufacture process vents for poly vinyl chloride manufacturers
Release or emission factors:	Media: air; Emission factors (mg/Nm ³) provided for overall VOC emissions (not 1,1-DCA specific) at various manufacturing process (mostly plastics manufacturing), with various air pollution control. Only PVC manufacturing reported DCE, emission factor for total VOCs=5.6 mg/Nm ³ (cyclone), '-' (incinerator), 1.2 (waste gas burner). Characteristics of gas stream:20% 1,2-dichlorobenzene (p. 4-5). Comparison of VOC emission factors measured in the study and other EPA databases (p. 6-7). Estimated via chemical sampling of stacks assumes 300 operational days/yr (p. 4)
Release frequency:	assumes 300 operational days/yr (p. 4)
Waste treatment methods and pollution control:	Some comparison data between uncontrolled vs controlled (p. 5)

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Methodology is known and expected to be accurate(uses EPA Method 18) but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data are from Taiwan, which is a non-OECD country.
	Metric 3: Applicability	Medium	Data are for polyvinyl chloride manufacturing which is not an occupational scenario within the scope of the risk evaluation. However, DCE is a precursor of vinyl chloride so emissions may be related to processing as a reactant
	Metric 4: Temporal Representativeness	Medium	Data are more than 10 years old (2007) but no more than 20 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized is fully characterized but discrete values are not provided and sample size is low.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Release data include most critical metadata but missing specifics on throughput/volume, and all of the units contributing to gas stream.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	Variability is addressed by considering different air pollution control devices, plants, and comparing with published emission factors. Uncertainty is also discussed with discussion on parameters, testing approaches and noting the differences reported in other published emissions reports.

Overall Quality Determination**Medium**

Study Citation: IPCS, (1995). 1,2-Dichloroethane (Second edition).
HERO ID: 5175349
Conditions of Use: Disposal

EXTRACTION

Parameter	Data
Description of release source:	WWTP effluent
Release or emission factors:	<2 - 74 ug/L (Pg. 16)
Waste treatment methods and pollution control:	Two-stage distillation (Pg. 13)
Comments:	Data is for WWTP in the Netherlands, 6 effluents tested

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from the Netherlands.
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination**Medium**

Study Citation:	Kodak Health and Environment Labs, (1988). Building 322 steamer emissions on 1,2-dichloroethane with cover letter dated 103188.			
HERO ID:	1629037			
Conditions of Use:	Incorporation into formulation, mixture, or reaction product			
EXTRACTION				
Parameter	Data			
Description of release source:	Steamer			
Release quantity:	ND - 0.001 (lbs./hr.) (Pg. 6)			
Comments:	Measured gas samples from process vent condenser.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for incorporation into formulation, mixture, or reaction product, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release media and release frequency provided but missing release days per year and waste treatment method.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	KVB Inc, (1980). An inventory of carcinogenic substances released into the ambient air of California: Final report - Task II and Task IV.			
HERO ID:	5443893			
Conditions of Use:	Intermediate in all other basic organic chemical manufacturing			
EXTRACTION				
Parameter	Data			
Release quantity:	150-1600 tpy (91% from one site) pg. 31			
Comments:	Media: air			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for processing as a reactant, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	Luft Environmental Consulting, (1993). AB 2588 Health risk assessment for Texaco Refining and Marketing Inc.'s Bakersfield Plant-Areas 1 and 2 Reporting Year 1991.			
HERO ID:	6570009			
Conditions of Use:	Processing aids, specific to petroleum production			
EXTRACTION				
Parameter	Data			
Description of release source:	Heaters, flares, ICEs, tank farms, tanks, SRU, wastewater treatment, fugitive emissions, blend area, natural gas loading			
Release quantity:	Emission estimates are given in Appendix B			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	The release data methodology is known or expected to be accurate but may not cover all release sources at the site.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for processing aids, specific to petroleum production, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Data are greater than 20 years old.	
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Release media and release frequency provided but missing waste treatment methods.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by giving emissions from multiple sources, but uncertainty is not addressed.	
Overall Quality Determination		Medium		

Study Citation:	Luin, Van, A. B., Starkenburg, Van, W. (1985). Hazardous Substances in Waste Water. Water Science and Technology 17(6-7):843–853.
HERO ID:	5443237
Conditions of Use:	Disposal

EXTRACTION

Parameter	Data
Description of release source:	WWTP effluent
Release or emission factors:	WWTP Effluent: <2 - 74 (ug/L) (Pg. 4)
Waste treatment methods and pollution control:	Oxidation ditch, activated sludge or tricking filter (Pg. 2)

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3: Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5: Sample Size	Low	Sample distribution is described qualitatively.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Release media and release frequency provided but missing release estimation method.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by multiple (6) site samples, but uncertainty is not addressed.

Overall Quality Determination**Medium**

Study Citation:	Martí, V., Jubany, I., Pérez, C., Rubio, X., Pablo, De, J., Giménez, J. (2014). Human health risk assessment of a landfill based on volatile organic compounds emission, immission and soil gas concentration measurements. Applied Geochemistry 49:218-224.			
HERO ID:	2517712			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	Closed Landfill			
Release or emission factors:	Emission flux [ug m ⁻² day ⁻¹]=1; Immission [ug m ⁻³]= 1.2; Other Studies=0.14-0.44; Release estimation method: Pyrex tubes with Carbotrap and Carboxen 569 using a pumping system; analyzed by means of a TD-GC-MS system. (Pg. 220).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Spain, an OECD country.
	Metric 3:	Applicability	Low	release data are for a non-occupational scenario (general population) that is similar to an occupational scenario within the scope of the risk evaluation
	Metric 4:	Temporal Representativeness	High	Data are no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release data include most critical metadata
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Variability is addressed by comparing their estimates with other published studies, limited discussion of uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Middleton, P., Sockwell, R., Carter, L., W.P. (1990). Aggregation and analysis of volatile organic compound emissions for regional modeling. Atmospheric Environment, Part A: General Topics 24(5):1107-1133.			
HERO ID:	87136			
Conditions of Use:	Unknown			
EXTRACTION				
Parameter	Data			
Release quantity:	36,000 metric tons (Pg. 23)			
Comments:	Media: air			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S
	Metric 3:	Applicability	Low	Data are for and unknown COU, which may be similar to an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Low	Sample distribution is described qualitatively.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release media and release frequency provided but missing release source, release estimation method, number of sites, waste treatment method.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Low		

Study Citation:	Nagel, C. J., Chanenchuk, C. A., Wong, E. W., Bach, R. D. (1996). Catalytic extraction processing: An elemental recycling technology. Environmental Science & Technology 30(7):2155-2167.			
HERO ID:	660326			
Conditions of Use:	disposal			
EXTRACTION				
Parameter	Data			
Description of release source:		Catalytic Extraction Processing (CEP)Release frequency: 15,000 hours/year of operations		
Release or emission factors:		Media: air. 7.5 (mg/kg) (Pg. 7)		
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release media and release frequency provided but missing release estimation method, waste treatment method.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	NCBI, (2020). PubChem Annotation Record for 1,2-Dichloroethane.			
HERO ID:	9641339			
Conditions of Use:	All			
EXTRACTION				
Parameter		Data		
Description of release source:		1,2-Dichloroethane’s production and use as a chemical intermediate, in soaps, as a lead scavenger and solvent(1) may result in its release to the environment through various waste streams(SRC). Its former use as a fumigant may have resulted in its direct release to the environment(page 38/79).		
Release quantity:		The global emission rate to the Northern Hemisphere has been estimated to be 400 - 500 ktons/year (page 41/79)		
Release or emission factors:		1,2-Dichloroethane was detected in one of 4 monitoring well headspace gases at a municipal solid waste disposal facility at 0.09 ng/cu m. 1,2-Dichloroethane was detected in 436 US industrial samples at an average concentration of 1200 parts/trillion; concentrations as high as 16, 38 and 45-113 ppb have been recorded at 3 production and use sites (page 41/79).		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability		Metric 1: Methodology	Low	Methodology data for release information is not specified.
Domain 2: Representativeness		Metric 2: Geographic Scope	High	Data is from the U.S., except for one figure.
		Metric 3: Applicability	High	Release data are for all industrial COUs.
		Metric 4: Temporal Representativeness	Medium	Release data vary in age, from 1980s to 2014.
		Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity		Metric 6: Metadata Completeness	Medium	Release data include release source, quantity, and emission factors, but are missing waste treatment and release frequency.
Domain 4: Variability and Uncertainty		Metric 7: Metadata Completeness	Medium	The release data addressed variability by summarizing different studies. Uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	Northrop Corporation, (1992). Northrop corporation aircraft division: Health risk assessment for west complex (final report) with attachments and cover letter dated 021492.
HERO ID:	1577139
Conditions of Use:	Unknown

EXTRACTION	
Parameter	Data
Description of release source:	Northrop Corporation Aircraft Division (El Segundo, CA) Toxic compounds are emitted by the following processes: • Degreasing activities to clean tools and parts. Emissions are due mostly to chemical solvents such as 1,1,1-trichloroethane. • Coating operations which perform spray application of paints and hand applications of adhesives and sealants. Emissions are primarily in the form of volatile organic compounds (VOCs) emitted during drying and particulate matter (PM) emitted during spraying. • Surface cleaning operations which most often use 1,1,1-trichloroethane. • Refrigerant recharge and purging of equipment lines. Emissions are fluorocarbons such as freon. • Combustion products from boilers. autoclaves. process heating ovens and space heaters.
Release quantity:	12.6 lb./yr (5.71 kg) (not specified whether 1,1-dichloroethane or 1,2-dichloroethane) (p. 25)
Release or emission factors:	Media: air; Max 0.05 lb./hr. dichloroethane (not specified whether 1,1-dichloroethane or 1,2-dichloroethane) (p. 25). Estimation Method: Extracted from the revised AS 2588 Air Toxics Inventory Report submitted to the SCAQMO by Northrop (1991)(p. 19) Submission indicates emissions are summarized in ""Appendix C"" which is not included in the PDF.

		EVALUATION	
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Low	Methodology is not specified.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	Medium	General industrial use - Actual use is unclear
	Metric 4: Temporal Representativeness	Low	Data are greater than 20 years old (early 1990s)
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics - Single values for lb./hr. and lb./yr provided
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Release media provided but no other metadata. No details on emission estimates - Emissions estimated for emissions inventory; report indicates emissions are summarized in "Appendix C" which is not included in the PDF.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination

Low

Study Citation:	OECD, (2011). Resource compendium of PRTR release estimation techniques, part 4: Summary of techniques for releases from products, version 1.0.			
HERO ID:	7348917			
Conditions of Use:	Commercial & Consumer Use			
EXTRACTION				
Parameter	Data			
Description of release source:	Building and construction products, Electrical and electronic products, Furniture, Nanoproducts, Packages and plastic bags, personal care and cleaning products, Textile and leather products, Toys and low-cost jewelry (page 17/109). Releases typically occur during the first use of a product, when carrying out maintenance of the product, and due to wearing, exposure to heat or light or other ageing of the product (page 63/109).			
Release or emission factors:	Table 23 contains emission factors and release estimation equations for various organic pollutants in end-use products (page 81/109).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	OECD paper provides general methods and equations used to calculate emissions, but details aren’t provided.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are provided by the OECD.	
	Metric 3: Applicability	High	Data are for various consumer and commercial uses which are in scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Medium	Paper was published in 2011, but most emission factor data is from 2003-2004, which is greater than 10 years old.	
	Metric 5: Sample Size	Low	Emission factor data is characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Release data include release source and emission factors. Formulas for release quantity are provided. Data lacks release frequency and waste treatment methods.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The release data study does not address variability or uncertainty.	
Overall Quality Determination		Medium		

Study Citation: Oil., Shell (1986). Fate of some specific compounds in the Norco chemical biotreater and their effect on the outcome of effluent bioassays.
HERO ID: 1629033
Conditions of Use: MFG/PROC

EXTRACTION

Parameter	Data
Description of release source:	chemical plant wastewater
Release or emission factors:	Concentration of 1,2DCA in Biotreater feed, effluent, and off gas provided in Table 2 (pg 16); Tables 3-4 on pg 17 also have similar data; effluent concentration data in table 1, pg 34-39; Table 1 on pg 46 has concentration data in offgas; more concentration data in Table 1 on pg 50-51; Table 4, pg 62-67; Table 7, pg 68-69
Waste treatment methods and pollution control:	WWT; biotreatment/activated sludge pilot plant study; air stripping (primary), biodegradation (secondary) (pg 6); 95% overall reduction for volatile priority pollutants (pg 8); 93-96% for 1,2DCA (pg 9); Table 5 (pg 18)
Comments:	media: water, air

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	The release data methodology is known or expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	Medium	Data are for a chemical production plant, but it is unclear what process(es) the wastewater originates from.
	Metric 4: Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided throughout various Tables).
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Release media provided but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by assessing EFs/% reduction for various chemicals and WWT operations, but uncertainty is not addressed.

Overall Quality Determination**Medium**

Study Citation:	Pervier, J. W., Barley, R. C., Field, D. E., Friedman, B. M., Morris, R. B. (1974). Survey reports on atmospheric emissions from the Petrochemical Industry.			
HERO ID:	5441658			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter		Data		
Description of release source:		EDC manufacturing facilities		
Release quantity:		Oxychlorination: 253 (MM Lbs./year) (Pg. 21); Direct Chlorination: 63 (MM lbs./year)		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Low	Sample distribution is described qualitatively.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release media and release frequency provided but missing treatment method, release estimation method, waste treatment method.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	Pudasainee, D., Kim, J. H., Lee, S. H., Park, J. M., Jang, H. N., Song, G. J., Seo, Y. C. (2010). Hazardous air pollutants emission from coal and oil-fired power plants. Asia-Pacific Journal of Chemical Engineering 5(2):299-303.			
HERO ID:	933329			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	Fuel burning			
Release or emission factors:	ND - 0.34 (ppm) (Pg. 4)			
Comments:	Releases estimated by US EPA TO-17 (ATD-GC/MS).			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	The release data methodology is known or expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from South Korea, an OECD country.
	Metric 3:	Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	Data is more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release media and release frequency provided but missing release days per year, number of sites, waste treatment methods.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by different fuel types being tested, but uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	Pudasainee, D., Kim, J., Lee, S., Park, J., Jang, H., Song, G., Seo, Y. (2007). HAPs emission characteristics from coal fired power plants with special reference to mercury. :848-852.
HERO ID:	1672452
Conditions of Use:	Fuels and related products

EXTRACTION

Parameter	Data
Description of release source:	Burning of anthracite coal, bituminous coal, and fuel oil at power plants
Release quantity:	media: air. Table 6 (pdf pg 4) gives ppm before and after control for each of 3 fuel types-N.D-.316
Waste treatment methods and pollution control:	Wet FGD systems, De-NOx systems (SNCR, SCR) pg 3

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	Medium	Data are from Korea, an OECD country.
Metric 3:	Applicability	High	Data are for fuels and related products, an in-scope occupational scenario.
Metric 4:	Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics (single value provided, doesn't state if its an average/median/etc.).
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed (measured multiple sites but doesn't address any differences in results).

Overall Quality Determination**Medium**

Study Citation:	Qiu, K., Yang, L., Lin, J., Wang, P., Yang, Y.,i, Ye, D., Wang, L. (2014). Historical industrial emissions of non-methane volatile organic compounds in China for the period of 1980-2010. Atmospheric Environment 86:102-112.			
HERO ID:	2373425			
Conditions of Use:	General			
EXTRACTION				
Parameter	Data			
Description of release source:	Industrial processes; industrial solvent utilization; storage and transport; other			
Release quantity:	Estimated annual NMVOC emissions (1980-2010) for various general processes compared with values from other articles (see Release Source column) (p. 110)			
Release or emission factors:	NMVOC emission factors summarized in tables on p. 104-106			
Comments:	NMVOC emission factors for various source categories - mainly USEPA or European Environment Agency (p. 103-104).			
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Article calculated emissions in China (a non-OECD country), but emission factors primarily from USEPA and Europe (assigned mid score of 2).
	Metric 3:	Applicability	Low	Data are for general industrial processes, which is similar to the in-scope occupational scenario for MFG and PROC (but only on NMVOC level). Also, not specific to any chemical.
	Metric 4:	Temporal Representativeness	Medium	EF dates vary from 1990s through 2000s (assigned mid score of 2).
	Metric 5:	Sample Size	Low	EFs provided for various processes, but derivation not discussed in this document.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	EFs provided for various processes, but derivation not discussed in this document.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Discusses variability with other estimates of overall NMVOC emissions in China, but does not discuss variability and uncertainty of EFs which are likely more relevant for risk assessment.
Overall Quality Determination			Low	

Study Citation:	Radian Corp, (1991). Air toxic hot spots - AB 2588 health risk assessment (volume I & II) (final reports) with attachments and cover letter dated 032991. 910000774:#86-910000774.			
HERO ID:	1356137			
Conditions of Use:	Petroleum production			
EXTRACTION				
Parameter	Data			
Description of release source:	Petrochemical production			
Release quantity:	1.62*10^-6 - 6.98*10^-5 (g/sec) (Pg. 34)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Methodology is known and expected to be accurate and cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for petroleum production, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Low	Sample distribution is described qualitatively.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release media and release frequency provided but missing release estimation method, waste treatment method.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by multiple release sources being tested, but uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	Radian Corp, (1991). Air toxic hot spots - AB 2588 health risk assessment - Shell Oil Company Martinez Refinery (volume I and II) with attachments, cover sheets and letter 040291. 910000771:#86-910000771.			
HERO ID:	1356138			
Conditions of Use:	Petroleum production			
EXTRACTION				
Parameter	Data			
Description of release source:	Petrochemical plant			
Release quantity:	8.63*10^-7 - 4*10^-5 (g/sec); 4.2 (lb./year) (Pg. 44)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Methodology is known and expected to be accurate and cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for petroleum production, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Low	Sample distribution is described qualitatively.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release media and release frequency provided but missing release estimation method, waste treatment method.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by multiple release sources being tested, but uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	Radian Corp, (1991). Letter from Chevron Corporation to USEPA submitting enclosed submission of four Chevron USA oil production facility risk assessment facilities in California with attachments.			
HERO ID:	1481749			
Conditions of Use:	Petroleum production			
EXTRACTION				
Parameter	Data			
Description of release source:	Petrochemical plant			
Release quantity:	0 - 1.752*10^-5 (g) (Pg. 178 - 208)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Methodology is known and expected to be accurate and cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for petroleum production, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release media and release frequency provided but missing release estimation method, waste treatment method.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by examining multiple release sources, but uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation: Rosenfeld, P. E., Feng, H., L.G. (2011). The petroleum industry. :57-71.
HERO ID: 6108171
Conditions of Use: Processing aid: petroleum production

EXTRACTION

Parameter	Data
Description of release source:	venting, leaking (valves, storage tanks, support equipment, etc.), emissions from fuel combustion devices (pg 2);
Release quantity:	"unreported fugitive emissions add 'over 80 million pounds of VOCs and over 15 million pounds of toxic pollutants' every year" (pg 2); "In 1997, Louisiana ranked second in the nation, behind Texas, in the amount of toxic substances released into the air and water: 183 million tons of toxic chemicals were emitted that year alone... Between 1958 and 1973, Dow Corporation buried 46,000 tons of toxic waste in unlined pits that now cover more than 30 underground acres (pg 5)
Waste treatment methods and pollution control:	incineration, land treating (off-site), chemical fixation, neutralization, WWT, burning as fuel (sludge) (pg 3-4)

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	High	Report uses high quality data from frequently-used sources (EPA, other agencies and industry).
Domain 2: Representativeness	Metric 2:	High	Data are from the U.S.
	Metric 3:	Low	Data are for processing aids: petroleum production, an in-scope occupational scenario; however, release sources/estimates are not specific to any chlorinated solvent (just mentions chlorinated solvents as a type of waste)
	Metric 4:	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Low	Sample distribution is characterized by no statistics (single estimates provided).
Domain 3: Accessibility/ Clarity	Metric 6:	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Medium	Variability addressed by considering varying geographies and waste/treatment types, but uncertainty is not addressed.

Overall Quality Determination**Medium**

Study Citation:	Roy F. Weston Inc, (1980). Characterization and fate of the discharge of priority pollutants from the Rohm and Haas Philadelphia plant into the Delaware low level collector of the Philadelphia sewer.
HERO ID:	1333014
Conditions of Use:	Manufacturing; Intermediate in all other basic organic chemical manufacturing; Intermediate in all other chemical product and preparation manufacturing; Other in all other chemical product and preparation manufacturing

EXTRACTION

Parameter	Data
Description of release source:	Rohm and Haas Philadelphia Plant
Release quantity:	"865 kg/day (1,907 lb./day) of 1,2-DCA in contaminated process sewer effluent to sewer - April 1979 (p. 33, 35) '498 kg/day (1,110 lb./day) of 1,2-DCA in contaminated process sewer effluent to sewer; June 1979 (p. 34) 245 kg/day (540 lb./day) Rohm and Haas effluent - December 1979 (p. 36) Influent and sludge flow rates (lb./day) for Northeast Philadelphia Treatment Plant summarized on p. 38-39"
Release or emission factors:	Media: water; Spiking experiment on Rohm and Haas effluent. 1,2-DCA showed 20,317 ug/L unspiked (p. 63). It's unclear whether spiked concentration is representative of typical operation. Method: water concentration sampling (p. 11)
Waste treatment methods and pollution control:	WWT

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	Data are greater than 20 years old (1980)
	Metric 5: Sample Size	Medium	Release estimates for 3 different days provided - unclear if representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Release media provided but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by 3 data points over different days (only 1 site) but uncertainty is not addressed.

Overall Quality Determination**Medium**

Study Citation:	Rule, K. L., Comber, W., S.D., Ross, D., Thornton, A., Makropoulos, C. K., Rautiu, R. (2006). Survey of priority substances entering thirty English wastewater treatment works. Water and Environment Journal 20(3):177-184.			
HERO ID:	1598403			
Conditions of Use:	POTW			
EXTRACTION				
Parameter	Data			
Description of release source:		Effluent sent to POTW from commercial, industrial, residential, agricultural, etc. sources. Samples were taken from 30 different POTWs.		
Release or emission factors:		1 of the 30 facilities recorded an average of 0.2 ug/L (rest were ND).		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from the UK, an OECD country.
	Metric 3:	Applicability	Uninformative	Data are for POTW treatment, and out-of-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	Data are greater than 10 years old but no more than 20 years old. [Published 2006]
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Uninformative	

Study Citation:	Stangroom, S. J., Collins, C. D., Lester, J. N. (1998). Sources of organic micropollutants to lowland rivers. Environmental Technology 19(7):643-666.			
HERO ID:	659430			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	Trade effluent; Sewage treatment effluent			
Release or emission factors:	Release factors: trade effluent - 117 (ug/L), 17% frequency of detection, Pg. 9; sewage treatment effluent: 1.39 (ug/L), 9.5% frequency of detection, Pg. 8.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from the United Kingdom, an OECD country.	
	Metric 3: Applicability	High	Data are for disposal, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (mean) but discrete samples not provided and distribution not fully characterized.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination		Low		

Study Citation:	Tsanibazaca, E., McIntyre, A. E., Lester, J. N., Perry, R. (1981). Concentrations and correlations of 1,2-dibromoethane, 1,2-dichloroethane, benzene and toluene in vehicle exhaust and ambient air. Environmental Technology Letters 2(7):303-316.			
HERO ID:	5425043			
Conditions of Use:	Incorporation into formulation, mixture, or reaction product			
EXTRACTION				
Parameter	Data			
Description of release source:	Automobile exhaust			
Release or emission factors:	0.48 - 2.14 (ug/m^3) (Pg. 6)			
Comments:	Releases estimated via DuPont P400 sampling pumps with Tenax GC Absorption tubes which were thermally desorbed and analyzed via gas chromatography.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from the United Kingdom, an OECD country.
	Metric 3:	Applicability	High	Data are for incorporation into formulation, mixture, or reaction product, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release media and release frequency provided but missing release days per year, number of sites, and waste treatment method.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty is addressed by the sampling and analytical methods. Variability is not addressed.
Overall Quality Determination		Medium		

Study Citation:	Tsiliyannis, C. A. (1999). Report: Comparison of environmental impacts from solid waste treatment and disposal facilities. Waste Management & Research 17(3):231-241.			
HERO ID:	660588			
Conditions of Use:	disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	Municipal Solid Waste Landfill			
Release or emission factors:	0.12 ppm (mean); 3.6 ppm (max), local value - 6 mg/m^3 (all dichloroethanes) present in biogas from landfill of municipal solid waste - additional details may be found in referenced sources: WMI, 1994 (p. 4). Rate of emissions of hydrocarbons is 200.5 mg/s and 32.4 g/t MSW.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Greece, an OECD country.
	Metric 3:	Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (mean, max) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release media and release frequency provided but missing other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by samples collected at multiple sites, but uncertainty is not addressed.
Overall Quality Determination		Medium		

Study Citation: U.S. EPA, (n.d.). AP-42: Chapter 3 - Stationary Internal Combustion Sources.
HERO ID: 10180484
Conditions of Use: Various Solvent Uses

EXTRACTION

Parameter	Data
Description of release source:	[AP-42 Section 3.1] digester gas-fired stationary gas turbines [740289, page 17 of 20 and 740290, page 45 of 47] Distillate oil-fired gas turbines [740290, page 40 of 47][AP-42 Section 3.2] 2-stroke lean-burn engines, 4-stroke lean-burn engines, 4-stroke rich-burn engines. Page 3-4 discusses what/how various chemicals/chemical types are emitted.
Release or emission factors:	[AP-42 Section 3.1] < 1.5 E-05 lb/MMBtu, Emission factors based on an average digester gas heating value (HHV) of 600 Btu/scf at 60oF. To convert from (lb/MMBtu) to (lb/106 scf), multiply by 600. [740289, page 17 of 20 and 740290 page 45 of 47, see this page for more information about the number including high load information (EF is the same)] [AP-42 Section 3.1 emission factor documentation] distillate oil-fired gas turbine HAP emission for 1,2-DCA is 2.02 E-05 Lb/MMBtu. [740290, page 40 of 47, see this page for more information][AP-42 Section 3.2] 4.22 E-05 lb/MMBtu for 2-stroke lean-burn engines (7 of 18) <2.36 E-05 lb/MMBtu for 4-stroke lean-burn engines (11 of 18) <1.13 E-05 lb/MMBtu for 4-stroke rich-burn engines (15 of 18) [from 740292, see pages for more detail] from 740291 see page 24, 28, and 32 respectively for more information on these factors.
Waste treatment methods and pollution control:	[AP-42 Section 3.1] See section 3.1.4 (Control Technologies), though seems mostly to focus on NOx emissions. The three emission controls for gas turbines are wet controls, dry controls, and post-combustion catalytic control. See section for more detail. [740289, starts on page 5 of 20] [AP-42 Section 3.2] Parametric controls (timing and operating at a leaner air-to-fuel ratio); combustion modifications such as advanced engine design (new sources) or major modification to existing sources (clean-burn cylinder head designs and prestratified charge combustion for rich-burn engines); postcombustion catalytic controls installed on the engine exhaust system (pg 4 of 18); pg 4-5 presents more detail on these control techs., including % efficiency (~90% for all) [from 740292]
Comments:	Note that this extraction is for 3.1 and 3.2 of the AP-42 document (along with each section's associated emission factor documentation). 3.3 and 3.4, also extracted in this file, do not appear to have 1,2-DCA information

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Methodology is known and expected to be accurate and cover all release sources at the site.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	High	Data is for an in-scope occupational scenario and contain chemical-specific emission factors.
	Metric 4: Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (assumed mean) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Release media provided but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by providing data for different engine types, but uncertainty is not addressed.

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Study Citation:		U.S. EPA, (n.d.). AP-42: Chapter 3 - Stationary Internal Combustion Sources.		
HERO ID:		10180484		
Conditions of Use:		Various Solvent Uses		
Domain	Metric	EVALUATION		Comments
		Rating		
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2022). DMR Data for TCEP, formaldehyde, trans-1,2-dichloroethylene, 1,1-dichloroethane, and 1,2-dichloroethane.			
HERO ID:	11181053			
Conditions of Use:	All			
EXTRACTION				
Parameter	Data			
Description of release source:	Provides company name and site location of release source.			
Release quantity:	Provides annual and period release quantities.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Low	Methodology used by submitters to estimate release data is not known.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	DMR is U.S. based data	
	Metric 3: Applicability	High	DMR includes industries included in the scopes of multiple chemicals	
	Metric 4: Temporal Representativeness	High	DMR data are less than 10 years old.	
	Metric 5: Sample Size	Medium	Universe is limited to NPDES permit holders; statistical representativeness is unclear.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	DMR includes release source and release quantity, but is missing emission factors, waste treatment information, and release frequency.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability is addressed by including multiple years of DMR data. DMR does not address uncertainty in submitter provided data.	
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2025). Toxics Release Inventory (TRI): 1,2-Dichloroethane, reporting years 2019-2024.			
HERO ID:	13246591			
Conditions of Use:	All			
EXTRACTION				
Parameter	Data			
Description of release source:	Provides description of release source.			
Release quantity:	TRI data gives fugitive air releases, stack air releases, on-site water and land releases, off-site releases, and on-site contained releases for 1,2-dichloroethane facilities.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Methodology is known and expected to be accurate and cover all release sources at the site.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for all conditions of use.	
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	Low	Sample distribution is described qualitatively.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by data from multiple facilities.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2025). Discharge Monitoring Report (DMR): 1,2-Dichloroethane, reporting years 2019-2024.			
HERO ID:	13246592			
Conditions of Use:	All			
EXTRACTION				
Parameter		Data		
Description of release source:		Provides company name and site location of release source.		
Release quantity:		Provides annual and period release quantities.		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	The release data methodology is known or expected to be accurate but only covers release sources described in the NPDES permit.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	DMR is U.S. based data
	Metric 3:	Applicability	High	DMR includes industries included in the scopes of multiple chemicals
	Metric 4:	Temporal Representativeness	High	DMR data are less than 10 years old.
	Metric 5:	Sample Size	Medium	Universe is limited to NPDES permit holders; statistical representativeness is unclear.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	DMR includes release source and release quantity, but is missing emission factors, waste treatment information, and release frequency.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability is addressed by including multiple years of DMR data. DMR does not address uncertainty in submitter provided data.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2025). National Emissions Inventory (NEI): 1,2-Dichloroethane, reporting years 2017 and 2020.
HERO ID:	13246593
Conditions of Use:	All

EXTRACTION

Parameter	Data
Description of release source:	Provides unit/process of release.
Release quantity:	Provides total emissions per release event.
Release frequency:	Provides annual operating time.
Waste treatment methods and pollution control:	Provides controls information.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Submitters provide general method used to calculate emissions, but details not provided.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	NEI is U.S. based data.
	Metric 3: Applicability	High	NEI includes industries included in the scopes of multiple chemicals.
	Metric 4: Temporal Representativeness	High	NEI data are from 2017 and 2020.
	Metric 5: Sample Size	Medium	Universe is limited to units subject to NESHAP with threshold potential to emit, although states may have different requirements; statistical representativeness is unclear.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	NEI includes release media and generally also includes daily and annual operating time, specific unit/process that is the source of release, and presence of engineering controls.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	NEI does not address variability or uncertainty in submitter provided data.

Overall Quality Determination**High**

Study Citation:	U.S. EPA, (2000). Building 322 steamer emissions on methylene chloride with cover letter dated 103188.			
HERO ID:	1629039			
Conditions of Use:	Incorporation into formulation, mixture, or reaction product			
EXTRACTION				
Parameter	Data			
Description of release source:	Steamer			
Release quantity:	ND - 0.001 (lbs./hr.) (Pg. 6)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for incorporation into formulation, mixture, or reaction product, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release media and release frequency provided but missing release days per year and waste treatment method.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	U.S. EPA, (1981). Chapter 4.6: Solvent degreasing. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.
HERO ID:	3045012
Conditions of Use:	Degreasing

EXTRACTION

Parameter	Data
Description of release source:	emissions from cold cleaners include waste solvent evaporation, solvent carryout (evaporation from wet parts), solvent bath evaporation, spray evaporation, agitation, diffusion and convection. (page 4 of 6)
Release or emission factors:	All Units: 1000 kg VOC/Mg solventTotal Cold cleaner: 0.3 Mg VOC/yr/unit or 0.4 kg/hr/m2Cold cleaner, waste solvent loss: 0.165 Mg VOC/yr/unitCold cleaner, solvent carryout: 0.075 Mg VOC/yr/unitCold cleaner, bath and spray evaporation: 0.06 Mg VOC/yr/unitCold cleaner per capita emissions: 1.8 kg nonmethane VOC per capita per year or 5.8 g nonmethane VOC per capita per dayOTVD: 9.5 Mg VOC/yr/unit or 0.7 kg/hr/m2Conveyorized vapor: 24 Mg VOC/yr/unitConveyorized nonboiling: 47 Mg VOC/yr/unit(page 4 of 6)
Release frequency:	313 day/yr (assume 6 day work week, page 3 of 6)
Waste treatment methods and pollution control:	Nearly all vapor degreasers are equipped with a waterseparator which allows the solvent to flow back into the degreaser. (page 3 of 6)Cover or enclosed design, drainage facility, water cover, refrigerated chiller, carbon adsorption or high freeboard, solid spray stream, safety switches and thermostats.Using these controls provides a total emission reduction of 13-38% for cold cleaning, 20-60% for vapor degreasing, and 40-60% for conveyorized degreasing. (page 5 of 6)Proper use of equipment, waste solvent reclamation, reduced exhaust ventilation, reduced conveyor or entry speed. These operating procedures provide a total emission reduction of 15-45% for cold cleaning, 15-40% for vapor degreasing, and 20-30% for conveyorized degreasing. (page 5 of 6)

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	High	Methodology is known and expected to be accurate and cover all air release sources at the site.
Domain 2: Representativeness	Metric 2:	High	AP-42 is based on U.S. data.
	Metric 3:	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Low	Assessment is based on data greater than 20 years old and prior to the latest NESHAP for halogenated solvent cleaning.
	Metric 5:	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	High	Release media, and emission factors provided, and assumed release frequency
Domain 4: Variability and Uncertainty	Metric 7:	Medium	Uncertainty not addressed. Variability addressed by considering multiple degreasing methods.

Overall Quality Determination**Medium**

Study Citation:	U.S. EPA, (1980). Chapter 4.7: Waste solvent reclamation. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.
HERO ID:	3840001
Conditions of Use:	Treatment/Recycling of Spent Solvents

EXTRACTION

Parameter	Data
Description of release source:	storage tank vents, condenser vents, incinerator stacks, and fugitive losses (equipment leaks, open solvent sources sludge, solvent loading, and solvent spills). (page 5 of 6)
Release or emission factors:	Storage tank vents: 0.01 kg VOC/Mg solventCondenser vents: 1.65 kg VOC/Mg solventIncinerator stack: 0.01 kg VOC/Mg solvent and 0.72 kg particulates/Mg solventSpillage: 0.10 kg VOC/Mg solventLoading: 0.36 kg VOC/Mg solvent(page 5 of 6)
Waste treatment methods and pollution control:	Handling includes loading waste solvent into process equipment and filling drums and tanks prior to transport and storage through submerged or bottom loading. Waste solvents are initially treated by vapor recovery or mechanical separation. Condensation of solvent vapors is accomplished by water-cooled condensers and refrigeration units. Initial treatment of liquid waste solvents is accomplished by mechanical separation methods. This includes both removing water by decanting and removing undissolved solids by filtering, draining, settling, and/or centrifuging. Mixed solvents are separated by multiple simple distillation methods, such as batch or continuous rectification. After distillation, water is removed from solvent by decanting or salting. (page 2-4 of 6)Carbon adsorption systems can remove up to 95 percent of the solvent vapors from an air stream. Volatile organic emissions from the storage of solvents can be reduced by as much as 98 percent by converting from fixed to floating roof tanks. Solvent vapors vented during distillation are controlled by scrubbers and condensers. Submerged rather than splash filling of storage tanks and tank cars can reduce solvent emissions from this source by more than 50 percent. (page 5-6 of 6)

EVALUATION

Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Methodology is known and expected to be accurate and cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	AP-42 is based on U.S. data
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and prior to the latest NESHAP for Off-Site Waste and Recovery Operations.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release media, and emission factors provided but missing release frequency.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination**Medium**

Study Citation:	U.S. EPA, (1995). AP-42: Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition.
HERO ID:	46492
Conditions of Use:	Disposal

EXTRACTION

Parameter	Data
Description of release source:	Emissions of volatile organic compounds (VOC) also vary greatly with incinerator type and operation. Incinerators with countercurrent airflow such as multiple hearth designs provide the greatest opportunity for unburned hydrocarbons to be emitted. In the MHF, hot air and wet sludge feed are contacted at the top of the furnace. Any compounds distilled from the solids are immediately vented, from the furnace at temperatures too low to completely destruct them.
Release or emission factors:	Cyclone Venturi 4.0 e-03 g/Mg 8.0 E-06 lbs/ton Venturi/Impingement/afterburner 3.0 E-02 g/Mg 6.0E-05 lbs/ton Venturi/Impingement 1.0 E-02 g/Mg 2.0E-05 lbs/ton
Waste treatment methods and pollution control:	The most widely used control device applied to a multiple hearth incinerator is the impingement tray scrubber. Older units use the tray scrubber alone while combination venturi/impingement tray scrubbers are widely applied to newer multiple hearth incinerators.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Low	The release data methodology is not specified.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	US
	Metric 3: Applicability	High	The release data are for an occupational scenario (sludge incineration) within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	1995 more than 20 years old
	Metric 5: Sample Size	Medium	Emission factors are provided along with a graph of the size distribution for controlled and uncontrolled emissions.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Release data include most critical metadata, including release media, process, unit operation, and activity that is the source of the release but does not include release frequency.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The release data study provides only limited discussion of the variability between different control technologies but does not include discussion of the uncertainty in the release results.

Overall Quality Determination**Medium**

Study Citation:	U.S. EPA, (1995). AP-42: Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition.
HERO ID:	46492
Conditions of Use:	Waste handling

EXTRACTION

Parameter	Data
Release or emission factors:	Uncontrolled landfill Gas concentrations 0.79 ppmv (Median)
Release frequency:	The rate of emissions from a landfill is governed by gas production and transport mechanisms. Production mechanisms involve the production of the emission constituent in its vapor phase through vaporization, biological decomposition, or chemical reaction. Transport mechanisms involve the transportation of a volatile constituent in its vapor phase to the surface of the landfill, through the air boundary layer above the landfill, and into the atmosphere. The three major transport mechanisms that enable transport of a volatile constituent in its vapor phase are diffusion, convection, and displacement.
Waste treatment methods and pollution control:	Control efficiencies for landfill Gas constituents Flare 88.68 (average)

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	High	EPA Method 25C
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	US
Metric 3:	Applicability	High	The release data are for an occupational scenario (Landfil gas release) within the scope of the risk evaluation.
Metric 4:	Temporal Representativeness	Low	1995 more than 20 years old
Metric 5:	Sample Size	Medium	1,2-Dichoroethane concentration and control efficiency data were provided.
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	High	Release data include all associated metadata, including release media; process, unit operation, activity that is the source of the release; and factors that impact the release frequency.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Low	The release data study did not provide data on variability or uncertainty.

Overall Quality Determination**Medium**

Study Citation:	U.S. EPA, (1985). Assessment of incineration as a treatment method for liquid organic hazardous wastes: Background report IV: comparison of risks from land-based and ocean-based incineration.			
HERO ID:	5436081			
Conditions of Use:	Distribution in Commerce			
EXTRACTION				
Parameter	Data			
Description of release source:	Spills/leaks from transfer and storage; stack emissions from incineration			
Release quantity:	Emelle Chickasaw storage and transfer system: 6 (metric tons/year) (Pg. 69); Undestroyed wastes: 6.84 (metric tons/year) (Pg. 101)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Methodology is known and expected to be accurate and cover all release sources at the site.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for distribution in commerce, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Data are greater than 20 years old.	
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Release media and release frequency provided but missing release estimation method, release days per year, number of sites and waste treatment method.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by testing multiple sources of release, but uncertainty is not addressed.	
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2019). National Emissions Inventory (NEI) [database]: CASRNs 79-00-5, 75-34-3, 107-06-2, 78-87-5, 84-61-7, 106-99-0, 106-93-4, 50-00-0, 85-44-9, 106-46-7, 85-68-7, 84-74-2, and 115-86-6.
HERO ID:	6535959
Conditions of Use:	All

EXTRACTION

Parameter	Data
Description of release source:	Provides unit/process of release.
Release quantity:	Provides total emissions per release event.
Release frequency:	Provides annual operating time.
Waste treatment methods and pollution control:	Provides controls information.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Submitters provide general method used to calculate emissions, but details not provided.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	NEI is U.S. based data.
	Metric 3: Applicability	High	NEI includes industries included in the scopes of multiple chemicals.
	Metric 4: Temporal Representativeness	High	NEI data are from 2017.
	Metric 5: Sample Size	Medium	Universe is limited to units subject to NESHAP with threshold potential to emit, although states may have different requirements; statistical representativeness is unclear.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	NEI includes release media and generally also includes daily and annual operating time, specific unit/process that is the source of release, and presence of engineering controls.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	NEI does not address variability or uncertainty in submitter provided data.

Overall Quality Determination**High**

Study Citation:	U.S. EPA, (1995). Chapter 4.10 commercial/consumer solvent use. AP-42: Compilation of air pollutant emission factors volume I: Stationary point and area sources.
HERO ID:	7310515
Conditions of Use:	Solvent Use

EXTRACTION	
Parameter	Data
Description of release source:	Evaporation of an aerosol spray, evaporation after application, and direct release in the gaseous phase. (page 1 of 2)
Release quantity:	National NonMethane VOC EmissionsAerosol products: 342,000 Mg/yrHousehold products: 183,000 Mg/yrToiletries: 132,000 Mg/yrRubbing compounds: 62,000 Mg/yrWindshield washing: 61,000 Mg/yrPolishes and waxes: 48,000 Mg/yrNonindustrial adhesives: 29,000 Mg/yrSpace deodorant: 18,000 Mg/yrMoth control: 16,000 Mg/yrLaundry detergent: 4,000 Mg/yr(page 1-2 of 2)
Release or emission factors:	National Nonmethane VOC Emissions per CapitaAerosol products: 1.6 kg/person/yr or 4.4 g/person/dayHousehold products: 0.86 kg/person/yr or 2.4 g/person/dayToiletries: 0.64 kg/person/yr or 1.8 g/person/dayRubbing compounds: 0.29 kg/person/yr or 0.80 g/person/dayWindshield washing: 0.29 kg/person/yr or 0.77 g/person/dayPolishes and waxes: 0.22 kg/person/yr or 0.59 g/person/dayNonindustrial adhesives: 0.13 kg/person/yr or 0.36 g/person/daySpace deodorant: 0.09 kg/person/yr or 0.24 g/person/dayMoth control: 0.07 kg/person/yr or 0.19 g/person/dayLaundry detergent: 0.02 kg/person/yr or 0.05 g/person/day(page 1-2 of 2)
Release frequency:	365 days/yr

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Methodology is known and expected to be accurate and cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	AP-42 is based on U.S. data.
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release media, quantity, and frequency provided but missing controls.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty addressed by addressing the inclusion of methane and nonreactive products in VOC estimates. Variability addressed by estimating emissions from multiple consumer and commercial product categories.

Overall Quality Determination

Medium

Study Citation:	U.S. EPA, (2021). National analysis TRI dataset (TRI): Data used for TSCA risk evaluations, reporting year 2019.			
HERO ID:	8347325			
Conditions of Use:	All conditions of use			
EXTRACTION				
Parameter	Data			
Description of release source:	Release sources include manufacturing, on-site processing, distribution, recycling, use as a chemical processing aid, and other ancillary uses.			
Release quantity:	TRI data gives fugitive air releases, stack air releases, on-site water and land releases, off-site releases, and on-site contained releases for 1,2-dichloroethane facilities.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Methodology is known and expected to be accurate and cover all release sources at the site.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for all conditions of use.	
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	Low	Sample distribution is described qualitatively.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by data from multiple facilities.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2019). TRI on-site and off-site reported disposed of or otherwise released (in pounds), for all industries.			
HERO ID:	8784984			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Release quantity:	On-site disposal and other releases: 458,112 lbs/yearOff-site disposal and other releases: 632,236 lbs/yearOn- and Off-site disposal and other releases: 1,090,349 lbs/year			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Methodology is known and expected to be accurate and cover all release sources at the site.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for disposal, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	High	Data less than 10 years old.	
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Release media and release frequency provided but missing waste treatment methods.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by giving on- and off-site emissions, but uncertainty is not addressed.	
Overall Quality Determination		High		

Study Citation: U.S. EPA, (2023). AP-42: Chapter 5 - Petroleum industry.
HERO ID: 9102566
Conditions of Use: Fuels and fuel additives: all other petroleum and coal products manufacturing

EXTRACTION

Parameter	Data
Description of release source:	Petroleum Refinery: The petroleum industry involves the refining of crude petroleum and the processing of natural gas into a multitude of products, as well as the distribution and marketing of petroleum-derived products. The primary pollutant emitted is volatile organic compounds arising from leakage, venting, and evaporation of the raw materials and finished products. In addition, a wide variety of fuel combustion devices emits all of the criteria pollutants and a number of toxic species. Transportation and Marketing of Petroleum Liquids: Evaporative emissions from the transportation and marketing of petroleum liquids may be considered, by storage equipment and mode of transportation used, in four categories: (1) Rail tank cars, tank trucks, and marine vessels: loading, transit, and ballasting losses. (2) Service stations: bulk fuel drop losses and underground tank breathing losses. (3) Motor vehicle tanks: refueling losses. (4) Large storage tanks: breathing, working, and standing storage losses. (See Chapter 7, "Liquid Storage Tanks".)
Release or emission factors:	Petroleum Refinery: Emission factors for total hydrocarbons (pg.11-14), fugitive emission leaks total VOC pg. 17; Transportation and Marketing of Petroleum Liquids: VOC emissions per L transferred for gasoline loading(pg. 8), emission factors for crude oil loading(pg. 9), and more emission factor tables (pg. 10-16)
Waste treatment methods and pollution control:	Transportation and Marketing of Petroleum Liquids: Measures to reduce loading emissions include selection of alternate loading methods and application of vapor recovery equipment. The latter captures organic vapors displaced during loading operations and recovers the vapors by the use of refrigeration, absorption, adsorption, and/or compression. The recovered product is piped back to storage. Vapors can also be controlled through combustion in a thermal oxidation unit, with no product recovery.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	The release data methodology is cited and included in a background zip file but may not cover all releases (i.e., focuses only on air releases)
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3: Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	Each section was published at different years (2015, 2008, and 1995-which no data was extracted), therefore generally the data is more than 10 years but less than 20 years old.
	Metric 5: Sample Size	Low	characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Release data include most critical metadata, including release media such as process, unit operation, and/or activity that is the source of the release, but lacks additional metadata, release frequency.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The release data study addresses variability in the determinants of release. The release data study addresses uncertainty in the release results.

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Study Citation:	U.S. EPA, (2023). AP-42: Chapter 5 - Petroleum industry.
HERO ID:	9102566
Conditions of Use:	Fuels and fuel additives: all other petroleum and coal products manufacturing

EVALUATION	
Domain	Metric
	Rating
Overall Quality Determination	Medium
Comments	

Study Citation:	UNEP, (1988). News about chemicals. International Register of Potentially Toxic Chemicals Bulletin 9(1):19.			
HERO ID:	5436106			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	”About 60% of the total emissions (about 0.2% of production) is estimated to be lost to air, water and soil at production facilities. Nearly 1/3rd of this loss is estimated to occur via disposal of heavy ends in vinyl chloride production (EDC tars). Losses via dispersive uses account for about 40% of the total emissions. Emissions also occur from contaminated water and from waste-disposal sites.”			
Release or emission factors:	”Emissions of 1,2-dichlorethane entering water may amount to about 0.1% of production volume; In addition, some of the emissions from EDC tars will also contaminate water”			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Low	The release data methodology is not specified.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data covers multiple countries.	
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	The data were collected more than 20 years old	
	Metric 5: Sample Size	Low	Data is characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Release data include release media but no other metadata.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The release data study does not address variability or uncertainty.	
Overall Quality Determination		Low		

Study Citation:	VI, (2020). Comment submitted by Richard Krock, Vice President, Regulatory and Technical Affairs, The Vinyl Institute (VI) on 1,1-dichloroethane, trans-1,2-dichloroethylene, and 1,1,2-trichloroethane.			
HERO ID:	11927540			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Release quantity:	For reporting year 2015, TRI emissions for these substances from EDC/VCM facilities are summarized as follows:• 1,1-Dichloroethane (Ethylidene Chloride): A subgroup of 15 EDC/VCM facilities released 9,360 pounds of 1,1-Dichloroethane to air and water which represents approximately 99+% of overall TRI releases to air and water from the total 18 facilities reporting.• 1,2-Dichloroethylene: A subgroup of 14 EDC/VCM facilities released 6,214 pounds of 1,2-Dichloroethylene to air and water which represents approximately 22% of overall TRI releases to air and water from the total 22 facilities reporting.8• 1,1,2-Trichloroethane: A subgroup of 18 EDC/VCM facilities released 19,955 pounds of 1,1,2-Trichloroethane to air and water which represents approximately 51% of overall TRI releases toair and water from the total 26 facilities reporting.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Methodology is known and expected to be accurate and cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Data were collected after the most recent NESHAPS and no more than 10 years old.
	Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All metadata provided.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			High	

Study Citation:	Walker, B. L., Cooper, C. D. (1992). Air pollution emission factors for medical waste incinerators. Journal of the Air and Waste Management Association 42(6):784-791.
HERO ID:	78369
Conditions of Use:	Disposal

EXTRACTION

Parameter	Data
Description of release source:	Medical Waste Incinerators
Release or emission factors:	Media: Incineration; Efs (ug/kg waste) for uncontrolled with an average of 115; and controlled, including chlorinated solvents included (p. 6) Uncontrolled: 11.6-2,040 (458 average); Controlled: 384-407 (396 average). Emissions obtained from survey
Waste treatment methods and pollution control:	Control efficiencies can be estimated using uncontrolled vs controlled emission factors (p. 6)

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from facilities in the U.S. and Canada
	Metric 3: Applicability	Medium	Data are for disposal, but not specifically for 1,2-DCA
	Metric 4: Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5: Sample Size	Medium	Statistical distribution of samples is characterized but only 6 data points for controlled emissions.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Release data include all associated metadata, waste treatment type, media, frequency.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by samples collected at multiple sites, but uncertainty is not addressed.

Overall Quality Determination**Medium**

Study Citation:	Wallace, L. A., Pellizzari, E., Leaderer, B., Zelon, H., Sheldon, L. (1987). Emissions of volatile organic compounds from building materials and consumer products. Atmospheric Environment 21(2):385-393.			
HERO ID:	23126			
Conditions of Use:	Adhesives			
EXTRACTION				
Parameter	Data			
Description of release source:	Off-gassing from Glued wallpaper, glued carpet			
Release or emission factors:	Wallpaper: 310 (ng/m^2 min) (Pg. 7) Carpet: 180 (ng/m^2 min)			
Comments:	Chamber testing of off-gassing.			
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Release data methodology is known but does not cover all release sources at a site and chamber testing is noted to possibility cause under-estimation.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	U.S. data
	Metric 3:	Applicability	Low	The release data are for a non-occupational scenario (indoor air for consumers/gen pop) that is similar to an occupational scenariowithin the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	High	Distribution of samples is characterized by a range, standard deviation, and sample size. Note, however, discrete values are not provided.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Release data include all associated metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The emissions data study discusses variability in their measurements between actual emissions occurring in buildings. Th study discusses areas where measurement may overestimate or underestimate emissions rates which provides context in the uncertainty in the release results.
Overall Quality Determination			Medium	

Study Citation:	Wallace, L. A., Pellizzari, E., Leaderer, B., Zelon, H., Sheldon, L. (1987). Emissions of volatile organic compounds from building materials and consumer products. Atmospheric Environment 21(2):385-393.			
HERO ID:	23126			
Conditions of Use:	Cleaners			
EXTRACTION				
Parameter	Data			
Description of release source:	Off-gassing from cleaners(steel wool soap pads, liquid detergent, and chlorine bleach scouring pads) and insectide			
Release or emission factors:	Cleaner: 12,000 (ng/m^2 min) (Pg. 7)			
Comments:	Chamber testing of off-gassing.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Release data methodology is known but does not cover all release sources at a site and chamber testing is noted to possibility cause over-estimation.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	U.S. data
	Metric 3:	Applicability	Uninformative	The release data are for a non-occupational scenario (indoor air for consumers/gen pop) that is similar to an occupational scenariowithin the scope of the risk evaluation but cleaners and insecticide were measured together and insecticide is a non-TSCA use.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	High	Distribution of samples is characterized by a range, standard deviation, and sample size. Note, however, discrete values are not provided.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Release data include all associated metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The emissions data study discusses variability in their measurements between actual emissions occurring in buildings. Th study discusses areas where measurement may overestimate or underestimate emissions rates which provides context in the uncertainty in the release results.
Overall Quality Determination		Uninformative		

Study Citation:	WHO, (1987). 1,2-Dichloroethane. 62(0):4-1 - 4-21.			
HERO ID:	22964			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Release quantity:	61,000 tons controlled (Pg. 2); 110,000 tons uncontrolled			
Release or emission factors:	”10 kg/ton production for controlled emissions (Pg. 2) 40 kg/ton production for uncontrolled emissions”			
Comments:	Emission factor appears to be related across the lifecycle of the chemical			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	The source is known but methodology is not specified; expected to cover all release sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Europe, which comprises of mostly OECD countries.
	Metric 3:	Applicability	High	Data are for manufacturing an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release media and release frequency provided but missing release source, release estimation method, waste treatment method.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The release data study does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation: Wong, J. M. (1998). Petrochemicals. Water Environment Research 70(4):658-664.
HERO ID: 1010105
Conditions of Use: Disposal

EXTRACTION

Parameter	Data
Description of release source:	Detected at the outle of a Wastewater treatment at Petrochemical plant
Waste treatment methods and pollution control:	Approach 1(Amcec)- dissolved air flotation, organoclays as a post-polisher (coulds also be used before granular activated carbon). Amcec's closed-loop hydrocarbon recovery process which combines nitrogen stripping, humidity modification, and activated carbon.Additional techniques reported were biological treatment, base anion exchange, cross-flow pack separator, steam strippers, aerated submerged fixed film reactor (ASFFR), chemical oxidation, coagulation, dual-media filtration, GAC adsorption, UF, RO, and degasification (Pg. 6)

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data are from Taiwan, a non-OECD country.
	Metric 3: Applicability	Low	Data are for scenario covered under fate but may be useful for the occupational scenario for Disposal
	Metric 4: Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5: Sample Size	N/A	N/A.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Various treatment methods are presented but important meta-data is missing.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability in the different treatment methods are discussed but provides only a limited discussion on uncertainty.

Overall Quality Determination**Low**

Study Citation:	Chern, J. M., Chou (1999). Volatile organic compound emission rates from mechanical surface aerators mass-transfer modelling. Industrial and Engineering Chemistry Research 38(8):3176-3185.
HERO ID:	2529906
Conditions of Use:	Disposal

EXTRACTION

Parameter	Data
Description of release source:	Aerator
Release or emission factors:	"ASCE: 0.957 Two-zone: 0.961(dimensionless emission rate) (Pg. 5)"
Waste treatment methods and pollution control:	Aeration
Comments:	ASCE-based model; two-zone model.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Model is free of mathematical errors and based on sound approaches/methods; however, choice of equations and parameters are not described.
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data are from Taiwan, a non-OECD country.
	Metric 3: Applicability	High	Model can be applied to disposal, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Low	Model is based on data greater than 20 years old and industry conditions that are expected to be outdated.
Domain 3: Accessibility/ Clarity	Metric 5: Metadata Completeness	Medium	Model approach, equations, and choice of parameter values are transparent. Rationales for choice of approach, equations, and parameter values are not provided.
Domain 4: Variability and Uncertainty	Metric 6: Metadata Completeness	Medium	Variability addressed by comparing results from two different models, but uncertainty is not addressed.

Overall Quality Determination**Medium**

Study Citation:	EIC, (2004). Louisiana toxic air pollutants dispersion modeling analysis report for Shell Chemical LP - Norco Chemical Plant - West Site, T-Unit.			
HERO ID:	11272716			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	Fugitive Stack Emissions			
Release or emission factors:	Modeled Emission Rates (g/s) [PDF Pg. 20-22] See modeled emission source parameters on PDF Pg. 18.Source ID 177: 3.4176E-04Source ID 179: 3.4508E-04Source ID 231: 2.2497E-12Source ID 232: 1.3967E-11Source ID 178: 2.4703E-03Source ID 180: 4.1246E-03Source ID 181: 4.4699E-05Source ID 182: 7.6925E-07Source ID 183: 2.5977E-03Source ID 184: 2.5261E-03Source ID 187: 6.8035E-03Source ID 188: 5.0923E-09Source ID 189: 9.1633E-04Source ID 190: 2.6784E-04Source ID 230: 4.6973E-04			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Model is free of mathematical errors and based on sound approaches/methods; however, choice of equations is not described.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Model can be applied to Disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	Model is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
Domain 3: Accessibility/ Clarity	Metric 5:	Metadata Completeness	Low	Model approach and parameters described but the underlying equations and parameter values are not provided. Rationales for choice of approach and parameters are not provided.
Domain 4: Variability and Uncertainty	Metric 6:	Metadata Completeness	Medium	Variability addressed by using multiple stack height parameters, but uncertainty is not addressed
Overall Quality Determination			Medium	

Study Citation:	Herrera, T. A., Lang, R., Tchobanoglous, G. (1989). A study of the emissions of volatile organic compounds found in landfill gas. :229-238.			
HERO ID:	2802277			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	Waste from landfill			
Release quantity:	PDF pg 8: 0.099 g/m2-d for convective and diffusive flux equation, 0.075 g/m2-d for diffusive flux equation, 0.089 g/m2-d for diffusive flux equation			
Release or emission factors:	PDF pg 8: 0.099 g/m2-d for convective and diffusive flux equation, 0.075 g/m2-d for diffusive flux equation, 0.089 g/m2-d for diffusive flux equation			
Comments:	factors in estimating the emission rates of trace gases include advection,diffusion, accumulation, and generation			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Model is free of mathematical errors and based on sound approaches/methods.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Model can be applied to disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Model is based on data greater than 20 years old and industry conditions that are expected to be outdated.
Domain 3: Accessibility/ Clarity	Metric 5:	Metadata Completeness	High	Model approach, equations, and choice of parameter values are transparent. Rationales for choice of approach, equations, and parameter values provided.
Domain 4: Variability and Uncertainty	Metric 6:	Metadata Completeness	Medium	Variability addressed by modeling both diffusive and convective flux, but uncertainty is not addressed
Overall Quality Determination		Medium		

Study Citation:	Kawamoto, K., Park, K. A. (2006). Calculation of environmental concentration and comparison of output for existing chemicals using regional multimedia modeling. Chemosphere 63(7):1154-1164.			
HERO ID:	6957413			
Conditions of Use:	Manufacture/Processing/Use			
EXTRACTION				
Parameter	Data			
Description of release source:	Chemical industry			
Release quantity:	Fig.2 shows estimated amounts of chemicals that are emitted to each environmental medium in Kanagawa, Japan.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	The model is free of mathematical errors and is based on scientifically sound approaches or methods. However, equations and choice of parameter values are not fully described and some equations and/or parameter values may not be appropriate for themodel’s application.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Japan, an OECD country.
	Metric 3:	Applicability	High	Model can be applied to in-scope occupational scenarios.
	Metric 4:	Temporal Representativeness	Medium	Model is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
Domain 3: Accessibility/ Clarity	Metric 5:	Metadata Completeness	Low	The model documentation describes the approach and parameters, but the equations and/or selection of parameter values are not provided.
Domain 4: Variability and Uncertainty	Metric 6:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	OxyChem, (1991). Letter from Occidental Chemical Corporation to USEPA submitting enclosed results from a dispersion modeling study on ethylene dichloride with attachments.			
HERO ID:	5447161			
Conditions of Use:	Processing as an intermediate			
EXTRACTION				
Parameter	Data			
Description of release source:	EDC fugitive emissions, Tank Farm			
Release quantity:	Tank Farm: 0.21 (lbs/hr), EDC Fugitives: 1.44 (lbs/hr) (Pg. 6)			
Comments:	Releases estimated via UNAMAP-6 version of the EPA ISCLT. (Pg. 4)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Model is free of mathematical errors and based on sound approaches/methods; however, choice of equations and parameters are not described.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Model can be applied to processing as an intermediate, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Model is based on data greater than 20 years old and industry conditions that are expected to be outdated.
Domain 3: Accessibility/ Clarity	Metric 5:	Metadata Completeness	Low	Model approach and parameters described but the underlying equations and parameter values are not provided. Rationales for choice of approach and parameters are not provided.
Domain 4: Variability and Uncertainty	Metric 6:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	ATSDR, (2001). Toxicological profile for 1,2-dichloroethane.		
HERO ID:	412348		
Conditions of Use:	Manufacture, processing, use		
EXTRACTION			
Parameter	Data		
Description of release source:	Manufacturing/processing/use facilities		
Release quantity:	air: 546,039 (lbs.) (Pg.183); water: 904 (lbs.)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S..
	Metric 3: Applicability	High	Data are for an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (mean) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium	

Study Citation: EC, (1994). Priority substances list assessment report: 1,2-dichloroethane.
HERO ID: 5160047
Conditions of Use: Processing as an intermediate

EXTRACTION

Parameter	Data
Description of release source:	Manufacturing/processing facilities
Release quantity:	atmosphere: 7.1 (tonnes) pg. 11
Release or emission factors:	In Ontario, the mean concentrations of 1,2-dichloroethane in undiluted effluents from the Sarnia plant ranged between 2.5 µg/L (0.5 kg/d) (1989/1990) and 25 µg/L (1992) (OME, 1992a; Street, 1992). It was not detected (detection limit = 1.0 µg/L) in the undiluted effluent of the plant manufacturing 1,2-dichloroethane in Alberta during 1991 and 1992 (AEC, 1992).
Waste treatment methods and pollution control:	Two-stage distillation followed by incineration (Pg. 11)

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Canada, an OECD country.
	Metric 3: Applicability	High	Data are for processing as an intermediate, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination**Medium**

Study Citation:	Envirologic Data, (1992). Assessment of risks from potential exposure to airbourne facility emissions under California AB 2588 for the Rohr Inc Facility Riverside, Calif (vol. 1) (final report) w-letter.			
HERO ID:	4214360			
Conditions of Use:	Processing as an intermediate			
EXTRACTION				
Parameter		Data		
Release quantity:		3.21 (lb./day) (Pg. 47); 1,170 (lbs./year) (Pg. 202)		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability		Metric 1: Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness		Metric 2: Geographic Scope	High	Data are from the U.S.
		Metric 3: Applicability	High	Data are for processing as an intermediate, an in-scope occupational scenario.
		Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
		Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity		Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty		Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	Hughes, K. (1995). No. 176. 1,2-dichloroethane.				
HERO ID:	5447627				
Conditions of Use:	Manufacture				
EXTRACTION					
Parameter		Data			
Description of release source:		Fugitive sources (e.g., valves, etc.), storage tanks, secondary sources (e.g., emissions from wastewater treatment processes), process vents and shipping operations			
Release quantity:		18,000 (tonnes) (Pg. 16)			
EVALUATION					
Domain		Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Assessment uses high quality data that are not from frequently-used sources and there are no known quality issues.	
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.	
	Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.	
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5:	Sample Size	Low	Sample distribution is described qualitatively.	
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination			Low		

Study Citation:	Northrop Corporation, (1992). Northrop corporation aircraft division: health risk assessment for east complex (final report) with attachments and cover letter dated 021492. 920000818:#86-920000818.			
HERO ID:	4214356			
Conditions of Use:	Paint booths, metal finishing chemical tanks			
EXTRACTION				
Parameter	Data			
Release quantity:	0.07 (lbs./hr.) (Pg. 29); 50.1 (lbs./year)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Medium	Data are for metal finishing, which is similar to the in-scope occupational scenario solvents (for degreasing and cleaning).
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation: OECD, (2009). Emission scenario documents on coating industry (paints, lacquers and varnishes).
HERO ID: 3827298
Conditions of Use: Formulation of Coatings and Use of Coatings

EXTRACTION

Parameter	Data
Description of release source:	PROC: material loading, heat-up, surface evaporation, filling, miscellaneous operations, material storage, leaks, spills USE: Application losses, equipment residues, drum residues
Waste treatment methods and pollution control:	incineration; Vessel extraction, LEV (95-97% capture efficiency for dusts), area ventilation, condensers, carbon adsorption, condensation, biological treatment, thermal incineration, catalytic incineration, air scrubbers (99% efficiency)

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	This ESD was not developed by EPA, but another OECD-member country.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple chemical functions and coating types

Overall Quality Determination**High**

Study Citation: OECD, (2009). Emission scenario document on adhesive formulation.
HERO ID: 3827299
Conditions of Use: Adhesives and Sealants

EXTRACTION

Parameter	Data
Release quantity:	Provides models for estimating various fugitive air releases
Release frequency:	days/yr equal to number of bt/yr
Waste treatment methods and pollution control:	Incineration; Baghouse filters: >99% Cyclones/mechanical collectors: 80-99%

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Medium	Data characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions and types of adhesives.

Overall Quality Determination**High**

Study Citation: OECD, (2013). Emission scenario document on the industrial use of adhesives for substrate bonding.
HERO ID: 3827300
Conditions of Use: Adhesives and sealants

EXTRACTION

Parameter	Data
Description of release source:	Container cleaning, unloading, equipment cleaning, application losses, curing/drying, trimming
Release or emission factors:	The ESD presents approaches for estimating the amount of the adhesive chemical of interest released during the application process.
Release frequency:	50-365 days/yr
Waste treatment methods and pollution control:	Incineration; thermal oxidizers (catalytic and thermal) and, to a lesser extent, carbon adsorbers and solvent recovery condensers as the most common control device Efficiencies: 0-100%

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions, types of adhesives, and end use markets.

Overall Quality Determination**High**

Study Citation:	OECD, (2010). Emission scenario document on formulation of radiation curable coatings, inks and adhesives.
HERO ID:	3840003
Conditions of Use:	Formulation of Coatings, inks, and adhesives

EXTRACTION

Parameter	Data
Description of release source:	Container cleaning, dusts and volatiles from unloading containers, vented losses during mixing, sampling, equipment cleaning, volatiles from loading containers, filter wastes
Release quantity:	Provides models for estimating various fugitive air releases
Release frequency:	250
Waste treatment methods and pollution control:	Incineration; Baghouse filters:>99% Cyclones/mechanical collectors: 80-99%

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data
	Metric 3: Applicability	Medium	The assessment is for an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, in terms of the type of industry, operations, and work activities.
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions and types of UV curable products.

Overall Quality Determination**Medium**

Study Citation:	OECD, (2009). Emission scenario document on plastic additives.			
HERO ID:	5079084			
Conditions of Use:	Plastic material and resin manufacturing			
EXTRACTION				
Parameter	Data			
Release or emission factors:	PLASTICISERS - Handling liquid raw materials: F(handling, water) = 0.01% (to liquid waste), F(handling, air) = 0%. Compounding: F(compounding, water) = F(compounding, air) = 0.025% (For dry blending and Banbury blending); F(compounding, air) = 0% (For plastisol compounding). Conversion: F(conversion, water) = F(conversion, air) = 0.125% (For calendaring, blown film); F(conversion, water) = F(conversion, air) = 0.025% (For Extrusion, injection moulding, spread coating)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	This ESD was not developed by EPA, but another OECD-member country.
	Metric 3:	Applicability	Medium	Data are for multiple in-scope occupational scenarios; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Low	Assessment from 2011 but is based on data greater than 20 years old.
	Metric 5:	Sample Size	Medium	Data characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by presenting emission factors for multiple scenarios/additive types but uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	OECD, (2002). SIDS initial assessment report: 1,2-dichloroethane. :203.		
HERO ID:	5160031		
Conditions of Use:	Manufacture		
EXTRACTION			
Parameter	Data		
Description of release source:	Manufacturing/processing facilities		
Release quantity:	atmosphere: 150 (tonnes) (Pg. 6); hydrosphere: 4.46 (tonnes) (Pg. 14)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Germany, an OECD country.
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium	

Study Citation:	OECD, (2011). Emission scenario document on the chemical industry.			
HERO ID:	6306753			
Conditions of Use:	Manufacture, processing, use			
EXTRACTION				
Parameter	Data			
Description of release source:	Stack Air: Reactor vents, distillation column vents, absorber units, strippers, sumps/decanter, dryers, cooling vents Fugitive Air: Valves, pump seals, compressor seals, pressure-relief valves, flanges/connections, open-ended lines, sampling connections Water: Drum cleaning, equipment cleaning, aqueous distillation streams, extraction, reaction water, absorption, solids-liquids separation, adsorption, condensation			
Release or emission factors:	Average emission factors for unit operations given in Table 7.1			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	This ESD was not developed by EPA, but another OECD-member country.
	Metric 3:	Applicability	Medium	Data are for multiple in-scope occupational scenarios; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Low	Assessment from 2011 but is based on data greater than 20 years old.
	Metric 5:	Sample Size	Medium	Data characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by presenting emission factors for multiple scenarios but uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	OECD, (2012). Emission scenario document on chemicals used in oil well production.
HERO ID:	6387322
Conditions of Use:	Fuels and related products

EXTRACTION

Parameter	Data
Release or emission factors:	Provides release estimation models for estimating releases of non-volatile chemicals in liquid formulations
Release frequency:	350 days/yr
Waste treatment methods and pollution control:	incineration, deepwell injection, Downhole produced water separation, Filter management, oil sludge minimization

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering on- and off-shore wells and chemical functions.

Overall Quality Determination**Medium**

Study Citation: OECD, (2009). Emission scenario document on transport and storage of chemicals.
HERO ID: 6393282
Conditions of Use: Transportation and Storage

EXTRACTION

Parameter	Data
Description of release source:	filling and emptying of containers, storage, pipelines, washing and cleaning, recycling and disposal of packaging
Release or emission factors:	Filling/emptying: 0.05-70 kg/tonne 0.21-0.61% (solids) Storage (breathing losses): 0.01-13.1 kg/m3 storage capacity-yr Fugitive emissions from leaking seals, connectors and flanges: 0.01-1.67 g/h Storage of solids in open systems: 0.12-20 kg/tonne Container residuals: <1% (road tankers); 0.19-0.63% (rail tankers); 1% (drums); 0.3% (IBCs) Fugitive emissions during container cleaning: 1.07-311 g/container (road tanker); 0.3-2,350 g/ container (rail and ship tanker) Disposal: 0.01% (drums); 0.3% (IBCs); 0.0025-0.25 kg/bag (solids)
Waste treatment methods and pollution control:	Vapor balancing

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	This ESD was not developed by EPA, but another OECD-member country.
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple chemical forms, containers and storage system types.

Overall Quality Determination**Medium**

Study Citation:	U.S. EPA, (2023). Use of laboratory chemicals - Generic scenario for estimating occupational exposures and environmental releases (Revised draft generic scenario).			
HERO ID:	10480466			
Conditions of Use:	Laboratory Chemicals			
EXTRACTION				
Parameter	Data			
Description of release source:	Container unloading, container cleaning, labware equipment cleaning, during laboratory analyses, waste disposal.			
Release or emission factors:	Transfer operation losses of solids: 0.5%Container Cleaning (liquids in small containers): 0.6%Container Cleaning (solids): 1%Labware equipment cleaning (liquids): 2%Labware equipment cleaning (solids): 1%laboratory waste disposal: 100%			
Release frequency:	260 day/yr			
Waste treatment methods and pollution control:	Labware rinsed with water. Non-hazardous chemicals to landfill. laboratory chemicals or solvents used to clean labware may be considered hazardous. hazardous waste must be disposed of by incineration or to designated hazardous waste landfills.Local ventilation, accurate labeling of wastes, using secondary containment for hazardous wastes, and contacting specialty disposal companies .			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality information/data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2022). Chemical repackaging - Generic scenario for estimating occupational exposures and environmental releases (revised draft).
HERO ID:	11182966
Conditions of Use:	Repackaging

EXTRACTION

Parameter	Data
Description of release source:	Transfer losses, container cleaning, equipment cleaning, transfer losses during loading. (see page 12 of 116 for more complete list. See section 4 starting on page 21 for more complete descriptions of each release scenario)
Release quantity:	Provides methodology to estimate releases based on various parameters including: opening area of cleaning equipment, physical-chemical properties, air velocity, etc. See section 4.3 on page 24 until 4.10 on page 33 for estimation methods
Release or emission factors:	See each section on page 24-33 (4.3 to 4.10) for release factors used/assumed in calculations
Release frequency:	The number of operating days is given in a range of 174-260 days/yr with an EPA default of 260 days/yr. (page 15 of 116)
Waste treatment methods and pollution control:	Filters used for fugitive dust emissions are disposed of in landfills or by incineration. (page 25 and 34 of 116) Wastewater is treated on-site or sent off to a POTW. (page 21 of 116, mentioned in several other locations as well) Automated pumps and containment systems are used to control emissions. Containment methods include bunds, kerbs, drip trays or any other systems that will prevent a spilled product escaping are recommended. (page 23 of 116)

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering emissions from multiple activities.

Overall Quality Determination**High**

Study Citation: U.S. EPA, (2014). Generic scenario draft on the use of additives in plastic compounding.
HERO ID: 3827195
Conditions of Use: Plastic and rubber products

EXTRACTION

Parameter	Data
Description of release source:	Unloading containers, spillage, Container cleaning, dusts and fugitive emissions from compounding, equipment cleaning.
Release quantity:	Provides models for estimating various fugitive air releases.
Release or emission factors:	Unloading solids: 0.1-0.5%Spillage: 0.01%Container cleaning: 1% (solids), 0.2% (bulk liquids) 0.6% (small containers for liquids) 3% (drums for liquids)Compounding dusts: 0.01-0.05%Compounding Volatiles: 0.002-0.05%Equipment Cleaning: 2%.
Release frequency:	148-264.
Waste treatment methods and pollution control:	Incineration. WWT: settling or clarification, neutralization, sludge treatment and/or dewatering, biological treatment, chemical precipitation, phase separation, adsorption.Air: Mechanical separation, settling or clarification, scrubbers, incineration/thermal destruction, condenser, adsorptionSolid waste streams: Settling or clarification, stabilization or chemical fixation prior to disposalNon-aqueous liquid waste streams: stabilization or chemical fixation prior to disposal, incineration/thermal destructionEfficiency: 0-100% depending on treatment method.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Medium	Data characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic types, and additive types.

Overall Quality Determination**High**

Study Citation:	U.S. EPA, (2004). Use of additives in foamed plastics – generic scenario for estimating occupational exposures and environmental releases – Draft.			
HERO ID:	6304171			
Conditions of Use:	Flexible and rigid polyurethane foam manufacture			
EXTRACTION				
Parameter	Data			
Description of release source:	Container residues, equipment residues, release of auxiliary blowing agents (ABAs), scrap or off-spec product disposal.			
Release or emission factors:	Equipment Cleaning: 2%ABAs: 0.0035-100%Scraps/off-spec: 12-30%.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data	
	Metric 3: Applicability	Low	COU is similar to an occupational scenario within the scope	
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple foam types.	
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2004). Additives in plastics processing (compounding) – generic scenario for estimating occupational exposures and environmental release – Draft.			
HERO ID:	6311218			
Conditions of Use:	Plastics compounding			
EXTRACTION				
Parameter	Data			
Description of release source:	Unloading containers, spillage, Container cleaning, dusts and fugitive emissions from compounding, equipment cleaning			
Release quantity:	Provides models for estimating various fugitive air releases			
Release or emission factors:	Unloading solids: 0.1-0.5%Spillage: 0.01%Container cleaning: 1% (solids), 0.2% (bulk liquids) 0.6% (small containers for liquids) 3% (drums for liquids)Compounding dusts: 0.01-0.05%Compounding Volatiles: 0.002-0.05%Equipment Cleaning: 2%			
Release frequency:	148-264			
Waste treatment methods and pollution control:	Incineration			
Comments:	Generic Scenario. Not specific to 1,2-Dichloroethane.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data
	Metric 3:	Applicability	Uninformative	The assessment is from an occupational or non-occupational scenario that does not apply to any occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Data characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic types, and additive types.
Overall Quality Determination		Uninformative		

Study Citation:	U.S. EPA, (2003). Transportation equipment cleaning - Generic scenario for estimating occupational exposures and environmental releases (draft).
HERO ID:	6385708
Conditions of Use:	Disposal

EXTRACTION

Parameter	Data
Description of release source:	Any water soluble heels that are compatible with the facility's treatment system and the conditions of the facility's wastewater discharge permit are usually combined with other wastewaters for treatment and discharge at the facility. Incompatible heels are segregated into drums or tanks for disposal by alternative means, which may include sale to a reclamation facility, landfill, or incineration. The TEC facility may reuse heels comprised of soaps, detergents, solvents, acids, or alkalis as tank cleaning solutions, as neutralizers for future heels, and for wastewater treatment.
Release or emission factors:	Between 35 and 1,124 gallons of wastewater per tank were reportedly generated during tank truck cleaning, between 76 and 2,399 gallons of wastewater per tank during rail tank car cleaning, and between 3,000 and 30,000 gallons of wastewater per tank during tank barge cleaning. Rail tank cars are more likely to be cleaned using steam than using caustic or detergent cleaning solutions and they typically generate between 3 and 121 gallons of heel. Tank trucks, intermediate bulk containers, and intermodal tank containers are generally considered empty when they arrive at the facility, but may contain between one quart and ten gallons of heel.
Waste treatment methods and pollution control:	Disposal methods for heel are presented in the scenario. Most facilities discharge treated wastewater to POTWs, and facilities with wastewater treatment typically include equalization, pH adjustment, physical settling, and oil/water separation.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	High	Assessment uses high quality information/data from frequently-used sources.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	This GS is based on U.S. data.
Metric 3:	Applicability	Medium	Data are for multiple in-scope occupational scenarios; however, data is general and not specific to a chemical.
Metric 4:	Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
Metric 5:	Sample Size	Medium	Sample distributions characterized by ranges/estimations with uncertain statistics.
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple container types and cleaning methods.

Overall Quality Determination**Medium**

Study Citation:	U.S. EPA, (2014). Use of additives in the thermoplastic converting industry - generic scenario for estimating occupational exposures and environmental releases.
HERO ID:	6385711
Conditions of Use:	Plastic material and resin manufacturing

EXTRACTION

Parameter	Data
Description of release source:	Container cleaning, spillage, dusts and fugitive emissions from converting, equipment cleaning, trimming wastes.
Release quantity:	Provides models for estimating various fugitive air releases.
Release or emission factors:	Container cleaning: 1%Spillage: 0.01%Unloading solids: 0.1-0.5%Converting dusts: 0.01%Converting Volatiles: 0.01-0.25%Equipment Cleaning: 2%Trimming: 2.5%
Release frequency:	137(average)-254.
Waste treatment methods and pollution control:	Incineration. WWT: settling or clarification, neutralization, sludge treatment and/or dewatering, biological treatment, chemical precipitation, air or steam stripping, absorption, chemical reduction, evaporation, incineration/thermal destruction, phase separationAir: Mechanical separation, settling or clarification, scrubbers, incineration/thermal destruction, condenser, adsorption, biological treatment, electrostatic precipitator, absorber, phase separation, neutralizationSolid waste streams: stabilization or chemical fixation prior to disposal, evaporation, sludge treatment/dewatering, incineration/thermal destruction, chemical oxidationNon-aqueous liquid waste streams: stabilization or chemical fixation prior to disposal, incineration/thermal destruction, neutralization, evaporationEfficiency: 0-100% depending on treatment method

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	This GS is based on U.S. data.
Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
Metric 4:	Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
Metric 5:	Sample Size	Medium	Data characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic types, and additive types.

Overall Quality Determination**High**

Study Citation:	U.S. EPA, (2004). Additives in plastics processing (converting into finished products) -generic scenario for estimating occupational exposures and environmental releases. Draft.
HERO ID:	6549571
Conditions of Use:	Additives in Plastics Processing (Converting into Finished Products)

EXTRACTION

Parameter	Data
Description of release source:	1. Container residue from plastic resin transport container released to water, incineration, or landfill.2. Dust generation from forming processes released to water or landfill.3. Fugitive air emissions from forming and molding processes released to water or air.4. Equipment cleaning and cooling water from forming and molding processes released to water, incineration, or landfill.5. Solid waste from trimming operations released to water or landfill.
Release quantity:	Container Residue from Compounding Transport Container: Daily Release from Container Residue (kg/site-day) = Daily Use Rate (kg/site-day) x Loss FractionDust Generation from Converting Activities Released to Water or Landfill: Daily release of dust = daily use rate x loss fractionFugitive Air from Converting Activities Released to Water or Air: Daily release to water (or air) from volatilization = daily use rate x loss fractionResidual from Converting Equipment Cleaning: Daily release from equipment cleaning = daily use rate x loss fractionTrimming Waste: Daily release from trimmings = daily use rate x loss fraction
Release or emission factors:	Container Residue from Compounding Transport Container - Standard CEB estimate for solid container residue is 1% loss.Dust Generation from Converting Activities Released to Water or Landfill - 0.01% loss of daily use rate, OECD 2003, based on estimates for filler additives.Fugitive Air from Converting Activities Released to Water or Air - A release of 0.25% of the daily use rate is estimated (OECD 2003, loss rates are based on high (0.25%), medium (0.05%), and low (0.01%) volatility at 200C for typical plasticizers in open processes such as calendaring, blown film, and spread coating).Residual from Converting Equipment Cleaning - The release is based on CEB standard estimate for equipment cleaning of entire process (2% loss of daily use rate) released to water.Trimming Waste - Waste generated from trimming, filing, and grinding (off-spec products are reground and reintroduced into the converting process) are estimated to be 2.5-10% of production.
Release frequency:	CEB standard assumption, 250 days per year based on 5 day work week and two weeks per year of operation shut down.
Waste treatment methods and pollution control:	Finished plastic items have a typical expected lifetime. After use, plastic items in the consumer market are released back into the environment. Used plastic articles are disposed to land or incineration or they are recycled. According to EPA's Office of Compliance Sector Notebook for the Rubber and Plastics Industry approximately 1% of plastics are recycled. A more recent report from EPA's Office of Solid Waste estimates 5.5% of plastics is recycled. The OECD Emissions Scenario Document on Plastic Additives estimates that 8% of plastics are recycled and 17% of plastics are incinerated for thermal recovery in the UK.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High
			The assessment uses high quality data and methods that are from a frequently used source and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High
	Metric 3:	Applicability	Medium
	Metric 4:	Temporal Representativeness	Low
	Metric 5:	Sample Size	Medium
			The data are from the United States and are representative of the industry being evaluated.
			The assessment is for an occupational scenario within the scope of the risk evaluation. However, data are not chemical specific.
			Data are greater than 20 years old.
			Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity			

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Study Citation:	U.S. EPA, (2004). Additives in plastics processing (converting into finished products) -generic scenario for estimating occupational exposures and environmental releases. Draft.
HERO ID:	6549571
Conditions of Use:	Additives in Plastics Processing (Converting into Finished Products)

EVALUATION

Domain	Metric	Rating	Comments
	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability is addressed by evaluation of various sources of release, but uncertainty in release estimation is not addressed.

Overall Quality Determination**Medium**

Study Citation:	U.S. EPA, (1995). Ap-42: Chapter 4.12 - Manufacture of rubber products.			
HERO ID:	7315841			
Conditions of Use:	Processing as a reactant			
EXTRACTION				
Parameter	Data			
Description of release source:	Milling and mixing of tire rubber compounds.			
Release or emission factors:	Emission factors of 1,2-dichloroethane are given below:Milling: 4.06*10^-8 lb/lb rubber.Calendar: 1.22E-07 lb/lb rubber.			
Comments:	More data for 1,1-Dichloroethane. Mixing: 1.39*10^-8 lb/lb rubber to 5.47*10^-7 lb/lb rubber.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for processing as a reactant, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering different steps of the manufacturing process.
Overall Quality Determination			Medium	

Study Citation:	Bertram, C. G. (1977). Minimizing emissions from vinyl chloride plants. Environmental Science & Technology 11(9):864.
HERO ID:	5436554
Conditions of Use:	Processing as an intermediate

EXTRACTION

Parameter	Data
Description of release source:	Loading operations; atmospheric venting of EDC storage tanks (Pg. 3)
Waste treatment methods and pollution control:	Incineration

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Low	Report does not specify the methods used.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	High	Data are for processing as an intermediate, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5: Sample Size	N/A	N/A - no samples.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination**Low**

Study Citation: Boegel, J. V. (1989). Air stripping and steam stripping. :6.107-6.118.
HERO ID: 5475844
Conditions of Use: Disposal

EXTRACTION

Parameter	Data
Description of release source:	Industrial aqueous wastes
Waste treatment methods and pollution control:	WWT; air stripping - limited to aqueous wastes with organics concentration <100 mg/L (pg 4); steam stripping; packed tower air stripper: >99% removal of volatile organics from water; steam stripping: 99% (pg 3)

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	Medium	Data are for disposal, an in-scope occupational scenario; however data is not specific to chemical (overall efficiency).
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5: Sample Size	N/A	pollution control efficiency
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by discussing different stripping techniques/configurations, but uncertainty is not addressed.

Overall Quality Determination**Medium**

Study Citation:	Canada, Health (2013). Guidelines for Canadian drinking water quality: Guideline technical document - 1,2-dichloroethane.
HERO ID:	7681894
Conditions of Use:	All

EXTRACTION

Parameter	Data
Waste treatment methods and pollution control:	Wastewater is treated via activated carbon adsorption, air stripping (packed tower aeration), combinations of aeration and granular activated carbon, membrane filtration, or advanced oxidation processes. Additional details start on PDF Pg. 16.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Canada, an OECD country.
	Metric 3: Applicability	High	Data are for processing as a reactant, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The report provides only limited discussion of the variability and uncertainty in the results.

Overall Quality Determination**High**

Study Citation:	CDC, (2009). Fourth national report on human exposure to environmental chemicals.			
HERO ID:	664488			
Conditions of Use:	Various			
EXTRACTION				
Parameter	Data			
Description of release source:	These volatile halogenated solvents may be released into the air from facilities that produce or use them, from contaminated waste water, or from hazardous waste sites... Because of their volatility, these halogenated solvents generally do not persist in soil or water. (pg 487-88)			
Comments:	media: air, land, water			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources (e.g., NTP, ASTDR, WHO, CDC).	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for various in-scope occupational scenarios.	
	Metric 4: Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	N/A	qualitative general information on releases	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	n/a - qualitative general release information	
Overall Quality Determination		High		

Study Citation:	Chang, C. P., Lin, T. C., Lin, Y. W., Hua, Y. C., Chu, W. M., Lin, T. Y., Lin, Y. W., Wu, J. D. (2016). Comparison between Thermal Desorption Tubes and Stainless Steel Canisters Used for Measuring Volatile Organic Compounds in Petrochemical Factories. Annals of Occupational Hygiene 60(3):348-360.			
HERO ID:	3120430			
Conditions of Use:	Petrochemical production			
EXTRACTION				
Parameter	Data			
Release or emission factors:	Releases estimated via Thermal desorption tubes, stainless steel cannisters.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data are from Taiwan, a non-OECD country.
	Metric 3:	Applicability	High	Data are for petrochemical production, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (mean) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by testing multiple refineries but uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	Davidson, I. W., Sumner, D. D., Parker, J. C. (1982). Ethylene dichloride: a review of its metabolism, mutagenic and carcinogenic potential. Drug and Chemical Toxicology 5(4):319-388.			
HERO ID:	200291			
Conditions of Use:	Unknown			
EXTRACTION				
Parameter	Data			
Release quantity:	It is estimated that in the United States alone, EDC emissions amount to nearly 53,000 metric tons annually .1			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Uninformative	Condition of use is unknown.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Uninformative		

Study Citation:	Davis, A. Y., Zhang, Q., Wong, S., J.P., Weber, R. J., Black, M. S. (2019). Characterization of volatile organic compound emissions from consumer level material extrusion 3D printers.			
HERO ID:	5645091			
Conditions of Use:	Plastic and rubber products			
EXTRACTION				
Parameter	Data			
Description of release source:	3D printing emissions			
Release or emission factors:	50% detection frequency for releases (Pg. 14)			
Comments:	Releases estimated via Single room exposure model. The modeling method and room parameters were obtained from the primary IAQ guideline for testing and assessing VOC source emissions. (Pg. 4)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for plastic and rubber products, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			High	

Study Citation:	Dossantos, F., L.M., Livingston, A. G. (1993). A novel bioreactor system for the destruction of volatile organic-compounds. Applied Microbiology and Biotechnology 40(1):151-157.
HERO ID:	5440334
Conditions of Use:	Disposal

EXTRACTION

Parameter	Data
Waste treatment methods and pollution control:	The biological treatment of waste-waters containing 1,2-dichloroethane (DCE) in conventional bioreactors results in air-stripping of DCE. In the present work, a novel bioreactor system intended to overcome this problem has been developed for the treatment of a synthetically concocted DCE-containing waste-water (1000 mg DCE l ⁻¹). The operation of a conventional air-lift bioreactor at a waste-water flow rate of 0.24 l h ⁻¹ led to 33% of the DCE supplied to the reactor being lost to the exit gas stream. The use of the novel enclosed system, operated with a recycling Oxygen sparge instead of air, resulted in negligible air-stripping at the same waste-water flow rate. A control system was implemented to add Oxygen as required to maintain the pressure of the recycle gas stream, and a scrubber removed the CO ₂ produced. Over 99% of DCE supplied was biodegraded during operation of this system, and virtually all carbon entering the system was evolved as CO ₂ .

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	The assessment or report uses high quality data and/or techniques or sound methods that are not from a frequently used source and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from the United Kingdom, an OECD country.
	Metric 3: Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5: Sample Size	N/A	N/A - no samples.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability is addressed by comparing 2 waste treatment methods but uncertainty is not addressed.

Overall Quality Determination**Medium**

Study Citation:	EC, (1984). Ethylene dichloride. Environmental and technical information for problem spills :i - 112.
HERO ID:	5436082
Conditions of Use:	Disposal

EXTRACTION**Parameter****Data**

Waste treatment methods and pollution control: Different waste treatment are stripping, solvent extraction, carbon adsorption.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	Medium	Data are from Canada, an OECD country.
Metric 3:	Applicability	High	Data are for disposal, an in-scope occupational scenario.
Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination**Medium**

Study Citation:	ERG, (1998). Air emissions inventories, volume 2: Point sources: Chapter 11: Preferred and alternative methods for estimating air emissions from plastic products manufacturing.
HERO ID:	7349020
Conditions of Use:	Plastic material and resin manufacturing

EXTRACTION

Parameter	Data
Description of release source:	The primary sources of emissions at plastic products manufacturing facilities are the pieces of equipment (e.g., extruder hopper, die head, sander) used to handle raw materials and produce the final product. These are typically the locations where chemical reactions occur, liquid solvents and solvent blends are exposed to the atmosphere, solid resin is heated and melted, and additives are introduced. In addition to emissions generated directly from primary production processes associated with plastic products manufacturing, there may be additional emissions produced by secondary processes at these facilities. Emission sources from these secondary processes include storage tanks, equipment leaks, wastewater treatment, combustion sources, and cleaning and surfacecoating operations.
Waste treatment methods and pollution control:	It is expected that VOC and organic HAP emissions could be controlled by incineration, adsorption, absorption, or condensation. Incineration and carbon adsorption have been identified as technologies currently in use at polystyrene foam manufacturing facilities (EPA, 1990). PM emissions generated from finishing operations, including cutting and grinding, are typically controlled by cyclones or fabric filters.

EVALUATION

Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Medium	Data are for processing as a reactant, an in-scope occupational scenario. No mention of 1,1,2-DCA specifically.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5:	Sample Size	N/A	N/A - control methods.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - control methods.

Overall Quality Determination**High**

Study Citation:	FDA, (1981). The sampling quantification of emissions from various laboratory sources and the determinations of ambient level concentrations with attached report and cover letter dated 081882.			
HERO ID:	4214079			
Conditions of Use:	Lab chemical			
EXTRACTION				
Parameter	Data			
Description of release source:	Laboratory fume hoods			
Release quantity:	ND - 0.3922 (lbs./10-hr work day)			
Release frequency:	260			
Comments:	appendix C, starting on page 152, has stack and receptor concentrations			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for laboratory use, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by sampling multiple locations but uncertainty is not addressed.	
Overall Quality Determination		Medium		

Study Citation:	Fishbein, L. (1979). Potential halogenated industrial carcinogenic and mutagenic chemicals. III. Alkane halides, alkanols and ethers. Science of the Total Environment 11(3):223-257.		
HERO ID:	18092		
Conditions of Use:	Use in gasoline		
EXTRACTION			
Parameter	Data		
Description of release source:	Evaporation from fuel tanks and carburetors of cars operated on leaded fuels.		
Release quantity:	The chief sources of ethylene dibromide and dichloride emissions are from automotive sources via evaporation from the fuel tank and carburetor of cars operated on leaded fuel. Emissions from these sources have been estimated to range from 2 to 25 mg/day for 1972 through 1974 model-year cars in the U.S.A [25].		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	Low	Data are for gasoline use in cars, which is similar to the the in-scope occupational scenario petroleum refining.
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (range) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Low	

Study Citation:	IARC, (1999). Re-evaluation of some organic chemicals, hydrazine, and hydrogen peroxide.			
HERO ID:	201838			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Description of release source:		”The majority of 1,2-dichloroethane released into the environment enters the atmosphere from its production and use as a chemical intermediate, solvent and lead scavenger in gasoline” pg. 509		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources. [IARC Monograph; cites US NLM etc.]
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated. [1999]
	Metric 5:	Sample Size	N/A	description of release source
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Provides a clear citation for the source of the qualitative release assessment that is provided.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	Description of release source
Overall Quality Determination			High	

Study Citation:		IARC, (1999). Re-evaluation of some organic chemicals, hydrazine, and hydrogen peroxide.			
HERO ID:		201838			
Conditions of Use:		Intermediate/Incorporated into formulation			
EXTRACTION					
Parameter		Data			
Description of release source:		”The majority of 1,2-dichloroethane released into the environment enters the atmosphere from its production and use as a chemical intermediate, solvent and lead scavenger in gasoline” pg. 509			
EVALUATION					
Domain		Metric		Rating	Comments
Domain 1: Reliability		Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources. [IARC Monograph; cites US NLM etc.]
Domain 2: Representativeness		Metric 2:	Geographic Scope	High	Data are from the U.S.
		Metric 3:	Applicability	High	Data are for processing as a reactant/incorporated into formulation, in-scope occupational scenarios.
		Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated. [1999]
		Metric 5:	Sample Size	N/A	description of release source
Domain 3: Accessibility/ Clarity		Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty		Metric 7:	Metadata Completeness	N/A	Description of release source
Overall Quality Determination			High		

Study Citation:	IARC, (1999). Re-evaluation of some organic chemicals, hydrazine, and hydrogen peroxide.			
HERO ID:	201838			
Conditions of Use:	Use: Solvent			
EXTRACTION				
Parameter	Data			
Description of release source:	”The majority of 1,2-dichloroethane released into the environment enters the atmosphere from its production and use as a chemical intermediate, solvent and lead scavenger in gasoline” pg. 509			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources. [IARC Monograph; cites US NLM etc.]	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for use as a solvent, in-scope occupational scenarios.	
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated. [1999]	
	Metric 5: Sample Size	N/A	description of release source	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	Description of release source	
Overall Quality Determination		High		

Study Citation:	Love, O. T., Jr, Miltner, R. J., Eilers, R. G., Fronk-Leist, C. A. (1983). Treatment of volatile organic compounds in drinking water.
HERO ID:	5255836
Conditions of Use:	Disposal

EXTRACTION

Parameter	Data
Waste treatment methods and pollution control:	Aeration, Adsorption, Witcarb 950 GAC, Nuchar WV-G GAC

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5: Sample Size	N/A	N/A - waste treatment methods
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A - waste treatment methods

Overall Quality Determination	High
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Study Citation:	Namiesnik, J., Zygmunt, B., Kozdron-Zabiegala, B. (1994). Some aspects of indoor air pollution and analysis. Polish Journal of Environmental Studies 3(4):5-19.			
HERO ID:	6021395			
Conditions of Use:	Adhesives and sealants			
EXTRACTION				
Parameter		Data		
Description of release source:		Glued wallpaper; glued carpet.		
Release or emission factors:		Cleaning agents and pesticides: 1.2 ug/m^2h. Glued Wallpaper: 0.3 ug/m^2h. Glued carpet: 0.2 ug/m^2h. pgs 3-4		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Poland, an OECD country.
	Metric 3:	Applicability	High	Data are for adhesives and sealants, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is described qualitatively.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by multiple scenarios being tested but uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	(2000). RCRA listing background document: trichloroethylene and perchloroethylene production. 1978. 7847019:#40-7847019.
HERO ID:	2799557
Conditions of Use:	Disposal

EXTRACTION

Parameter	Data
Description of release source:	Hex waste
Release quantity:	8,000 (ppm) (Pg. 10)
Release or emission factors:	8,000 (ppm) (Pg. 10)
Waste treatment methods and pollution control:	Landfill disposal

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination**Medium**

Study Citation:	Oil., Shell (1982). Tertiary water treatment I. A preliminary assessment of active carbon sorption.
HERO ID:	1441911
Conditions of Use:	Manufacturing

EXTRACTION

Parameter	Data
Waste treatment methods and pollution control: Comments:	Filtration/Activated Carbon Technology - lab scale study of plant effluents to study effectiveness.60-70% effective in lab-scale studies (page 33, 38,) Lab-scale study

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	High	Data are for manufacturing, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5: Sample Size	N/A	N/A (facility treatment description)
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination**Medium**

Study Citation:	Peinemann, K. V., Ohlrogge, K., Wind, J. (1994). Industrial applications of membranes to control VOC emissions. Studies in Environmental Science 61:375-385.
HERO ID:	5444204
Conditions of Use:	Disposal

EXTRACTION

Parameter	Data
Waste treatment methods and pollution control:	Thin-film composite membrane modules. The membrane has a three layer structure: a nonwoven polyester or polyolefin fabric, a microporous layer made from polysulfone, polyimide, polyetherimide or polyvinylidene fluoride and a thin (0.5 to 2 µm) pore-free coating of a rubbery polymer. (Pg. 376)

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Low	Report does not specify the data used.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Germany, an OECD country.
	Metric 3: Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5: Sample Size	N/A	N/A.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination**Low**

Study Citation:	Randel, S. (1989). Nine plants enter an environmental world. Chemical Business 11(9):27-29.
HERO ID:	5441866
Conditions of Use:	Manufacture

EXTRACTION

Parameter	Data
Waste treatment methods and pollution control:	1989 Corpus Christi plant: (Page 1) "To control emissions, all gases go through one of two vent gas incinerators—the plant has 100 percent spare capacity for maintenance purposes." (Page 2) "Waste water is stripped of as much EDC as possible, and any hazardous waste is incinerated. " "Part of the waste stream, primarily 1,1,2, trichlorethane, is sold as byproduct to B.F. Goodrich Co. for EDC feedstock "

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	High	Data are for manufacturing, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5: Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination**Medium**

Study Citation:	Trenholm, A., Lapp, T., Scheil, G., Cootes, J., Klamm, S., Cassady, C. (1988). Total mass emissions from a hazardous waste incinerator. Journal of Hazardous Materials 18(1):99-106.
HERO ID:	6151563
Conditions of Use:	Disposal

EXTRACTION**Parameter****Data**

Release or emission factors:	Stack concentration for different runs varied from 0 - 2.6 (ppb) (Pg. 6)
Waste treatment methods and pollution control:	Incineration
Comments:	Release estimation method was VOST.

EVALUATION**Domain****Metric****Rating****Comments**

Domain 1: Reliability

Metric 1:

Methodology

Medium

Report uses high quality data that are not from frequently-used sources and there are no known quality issues.

Domain 2: Representativeness

Metric 2:

Geographic Scope

High

Data are from the U.S.

Metric 3:

Applicability

High

Data are for disposal, an in-scope occupational scenario.

Metric 4:

Temporal Representativeness

Low

Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.

Metric 5:

Sample Size

High

Statistical distribution of samples is fully characterized (discrete sampling data provided).

Domain 3: Accessibility/ Clarity

Metric 6:

Metadata Completeness

Medium

Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.

Domain 4: Variability and Uncertainty

Metric 7:

Metadata Completeness

Medium

Uncertainty is addressed by performing multiple test runs using two methods. Variability is not addressed.

Overall Quality Determination**Medium**

Study Citation:	U.S. EPA, (1995). Chapter 4.2: Introduction to surface coating. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.
HERO ID:	7315820
Conditions of Use:	adhesives and sealants: coating operations

EXTRACTION

Parameter	Data
Release or emission factors:	Release or emission factors: for different types of coating (See sections: 4.2.2.1 for Industrial surface coating, 4.2.2.2 for Can Coating, 4.2.2.3 for Magnetic Wire Coating, 4.2.2.4 for Other Metal Coating, 4.2.2.5 for Flat Wood Interior Panel Coating, 4.2.2.6 for Paper Coating, 4.2.2.7 for Polymeric Coating Of Supporting Substrates, 4.2.2.8 for Automobile And Light Duty Truck Surface Coating Operations, 4.2.2.9 for Pressure Sensitive Tapes And LabelsSolvent base surface coating, 4.2.2.10 for Metal Coil Surface Coating, 4.2.2.11 for Large Appliance Surface Coating, 4.2.2.12 for Metal Furniture Surface Coating, 4.2.2.13 for Magnetic Tape Manufacturing, 4.2.2.14 for Surface Coating Of Plastic Parts For Business Machines
Waste treatment methods and pollution control:	Waste treatment methods and pollution control for different types of coating (See sections: 4.2.2.1 for Industrial surface coating, 4.2.2.2 for Can Coating, 4.2.2.3 for Magnetic Wire Coating, 4.2.2.4 for Other Metal Coating, 4.2.2.5 for Flat Wood Interior Panel Coating, 4.2.2.6 for Paper Coating, 4.2.2.7 for Polymeric Coating Of Supporting Substrates, 4.2.2.8 for Automobile And Light Duty Truck Surface Coating Operations, 4.2.2.9 for Pressure Sensitive Tapes And LabelsSolvent base surface coating, 4.2.2.10 for Metal Coil Surface Coating, 4.2.2.11 for Large Appliance Surface Coating, 4.2.2.12 for Metal Furniture Surface Coating, 4.2.2.13 for Magnetic Tape Manufacturing, 4.2.2.14 for Surface Coating Of Plastic Parts For Business Machines

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High Recognized EPA Reference (AP-42)
Domain 2: Representativeness	Metric 2:	Geographic Scope	High US
	Metric 3:	Applicability	High The report is for an occupational scenario (surface coating) within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low 1995 more than 20 years old
	Metric 5:	Sample Size	N/A Qualitative information
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High The report clearly documents its data sources, results, andassumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A Qualitative information

Overall Quality Determination**High**

Study Citation:	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.			
HERO ID:	7325487			
Conditions of Use:	Processing as a reactant: Incorporation into formulation, mixture, or reaction product			
EXTRACTION				
Parameter	Data			
Description of release source:	LIQUID PESTICIDE FORMULATIONSources of EDC emissions from pesticide formulation include storage vessels, mixing vessel vents, and leaks from pumps, valves, and flanges. insufficient information is available for the development of EDC emission factors for liquid pesticide formulation facilities.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	US EPA study	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	US	
	Metric 3: Applicability	High	The report is for an occupational scenario (LIQUID PESTICIDE FORMULATION) within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Low	1984 - more than 20 years old	
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range but uncertain statistics are not provided. It is unclear if analysis is representative.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.	
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.			
HERO ID:	7325487			
Conditions of Use:	Other uses			
EXTRACTION				
Parameter	Data			
Description of release source:		Ethylene Dichloride as a grain fumigantEmissions of EDC from fumigant mixtures occur during fumigant application and when fumigated grain is exposed to the atmosphere, for instance, during turning or loading. The rate of emissions of EDC from fumigant use depends on a number of factors including the type of grain, the type and concentration of fumigant applied, the type of storage (whether loose or tight-fitting), the manner in which the grain is handled, and the rate of release of fumigant residues in and on the grain. Although high sorption efficiencies (84 percent) have been reported for certain cereals, it is generally concluded that by the time the grain is processed, essentially all of the retained EDC will have been dissipated to the atmosphere.		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	US EPA study
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US
	Metric 3:	Applicability	High	The report is for an occupational scenario (Ethylene Dichloride as a grain fumigant) within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	1984 - more than 20 years old
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range but uncertain statistics are not provided. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.			
HERO ID:	7325487			
Conditions of Use:	Adhesives and Sealants			
EXTRACTION				
Parameter	Data			
Description of release source:		Because EDC is used as a solvent in paints, coatings, and adhesives, it is estimated that all of the EDC used in these products is eventually emitted to the atmosphere. Data are not available on the relative amounts of EDC emitted during formulation and use of these products.		
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	US EPA study
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US
	Metric 3:	Applicability	High	The report is for an occupational scenario (EDC is used in the manufacture of paints, coatings, and adhesives) within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	1984 - more than 20 years old
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range but uncertain statistics are not provided. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.			
HERO ID:	7325487			
Conditions of Use:	Other use			
EXTRACTION				
Parameter	Data			
Description of release source:		The solvent used in extraction processes is generally recovered by low pressure distillation. Some solvent is lost to the atmosphere from valves, pumps, and compressors; in spills; and during transfer operations. It is estimated that in published literature that about 95 percent of the EDC consumed in solvent extraction processes is emitted to the atmosphere, while about 5 percent is discharged with solid wastes. These solid wastes are generally incinerated.		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	US EPA study
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US
	Metric 3:	Applicability	High	The report is for an occupational scenario (Ethylene dichloride as an extraction solvent) within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	1984 - more than 20 years old
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range but uncertain statistics are not provided. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.			
HERO ID:	7325487			
Conditions of Use:	disposal			
EXTRACTION				
Parameter		Data		
Description of release source:		Volatilization from waste treatment, storage and disposal facilitiesConsiderable potential exists for volatile substances, including EDC, to be emitted from hazardous waste treatment, storage and handling facilities. If such a facility is known to handle EDC, the potential should be considered for some air emissions to occur.		
Release or emission factors:		Volatilization from waste treatment, storage and disposal facilitiesSeveral studies show that low levels of EDC may be emitted from municipal wastewater treatment plants. In a test at a small municipal treatment plant (handling 40% industrial and 60% municipal sewage), EDC emission rates from the aeration basins were measured at levels ranging from 5 to 10 grams/hour. Tests at a larger municipal treatment plant (handling about 50 percent industrial sewage) show that less than 92 to 184 grams/day of EDC are emitted, primarily from air stripping as part of the activated sludge treatment process. This emission rate was calculated from the EDC content of the influent to the plant, and assuming 50 to 100 percent volatilization as part of the overall treatment process, which is the range of removal observed for other volatiles. Too little data are available to extrapolate these test results to other wastewater treatment plants.		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability		Metric 1: Methodology	High	US EPA study
Domain 2: Representativeness		Metric 2: Geographic Scope	High	US
		Metric 3: Applicability	High	The report is for an occupational scenario (Volatilization from waste treatment, storage and disposal facilities) within the scope of the risk evaluation.
		Metric 4: Temporal Representativeness	Low	1984 - more than 20 years old
		Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range but uncertain statistics are not provided. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity		Metric 6: Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty		Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation: U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.
HERO ID: 7325487
Conditions of Use: Domestic Manufacture

EXTRACTION

Parameter	Data
Description of release source:	Ethylene dichloride process emissions originate from the purging of inert gases from the oxychlorination vent and the direct chlorination vent. The level of EDC in the oxychlorination vent gas is reduced by either an absorber/stripper combination or a refrigerated condenser. In an oxygen process, the purge gas can be dried and the contained ethylene can be chlorinated in a separate direct chlorinator to produce additional EDC. The small vent from this direct chlorinator can be combined with the vent from the other direct chlorinator and other vents from the process and incinerated. This treatment is reported to essentially eliminate all emissions of EDC and VCM. Process emissions of EDC also result from the release of gases from the column vents. Column vents include vents from the wastewater steam stripper, the drying column, the heads column, and the EDC finishing column. Incineration reduces EDC emissions by at least 98 percent. Ethylene dichloride emissions result from the storage of EDC during in-process and final product stages, assuming a fixed-roof tank, half full, and 11°C diurnal temperature variation. Generally, all raw materials, products, and waste byproducts are transported by pipeline. This may not be the case for all plants as some, where loading and unloading operations could result in additional emissions. Fugitive emissions of EDC and other volatile organics result from leaks in process valves, pumps, compressors, and pressure relief valves. The plant is estimated to have 38 pumps handling EDC or other light liquids. There are an estimated 40 pressure relief valves in volatile organics service and 900 process valves handling EDC or other liquids. Fugitive emission quantities for specific production facilities are dependent on the age of equipment, level of preventative maintenance, and leak detection programs. Secondary emissions can result from the handling and disposal of process waste-liquid streams. Wastewater treatment at an EDC production plant may consist of neutralization and steam stripping followed by either deep well injection or biotreatment. The use of an open-pit neutralization system may result in substantial EDC air emissions. Handling of wastewater prior to deep well injection may also result in EDC emissions; however, emissions after injection are negligible. Emissions of EDC from a biotreater are affected strongly by the biotreater process configuration, the temperature of ambient air and wastewater, type of aeration device used, degree of aeration, and hydraulic retention time of the system. EDC wastewater to a biotreater originates from several sources as well as from spills, drips, stormwater runoff from concrete pads under process equipment, and washing down of equipment. In an activated sludge biotreatment system, EDC is not a readily biodegradable compound. Most biotreater activated sludge systems consist of an open tank with surface mixers for aeration and mixing. The removal of EDC by air stripping in these systems can be extremely high (over 99 percent).
Release or emission factors:	Average EDC emission rates of 3.249 and 3.5810 kg/Mg of EDC produced have been reported from the absorber column. Emissions from the refrigerated condenser of one EDC producer were calculated to be 2.40 kg/Mg of EDC produced. The emission factors for biotreaters were based on production rates of approximately 1.1 x 10³ Mg/day. Emission data were not available for neutralization or deep well injection. Oxychlorination - Air process - Absorber/stripper uncontrolled EF 3.24 kg/Mg; with thermal oxidizer controlled EF <0.0648 kg/Mg Oxychlorination - Air process - Absorber/stripper uncontrolled EF 3.58 kg/Mg; with catalytic oxidizer controlled EF <0.280 kg/Mg Oxychlorination - Air process - refrigerated condenser uncontrolled EF 2.40 kg/Mg; with thermal oxidizer 98+ % reduction controlled EF <0.0480 kg/Mg Oxychlorination - Oxygen process uncontrolled EF 0.462 kg/Mg; with thermal oxidizer controlled EF <0.0092 kg/Mg Direct chlorination vent uncontrolled EF 1.08 kg/Mg; with refrigerated condenser controlled EF 0.0693 kg/Mg (calculated) 0.17 kg/Mg (literature) Direct chlorination vent uncontrolled EF 1.08 kg/Mg; with thermal oxidizer controlled EF <0.0216 kg/Mg Direct chlorination vent uncontrolled EF 1.08 kg/Mg; with refrigerated condenser controlled EF 0.162 kg/Mg (calculated), 0.26 kg/Mg (literature) Column vents uncontrolled EF 3.00 kg/Mg; with thermal oxidizer controlled EF <0.0600 kg/Mg Storage vents in-process uncontrolled EF 0.0149 kg/Mg; with thermal oxidizer controlled <0.0003 kg/Mg Storage vents in-process uncontrolled EF 0.0149 kg/Mg; with refrigerated condenser controlled EF 0.0022 kg/Mg Storage vents product uncontrolled EF 0.0733 kg/Mg; with thermal oxidizer controlled EF <0.0015 kg/Mg Storage vents product uncontrolled EF 0.0733 kg/Mg; with refrigerated condenser controlled EF 0.0110 kg/Mg Process fugitive uncontrolled EF 0.265 kg/Mg; with detection & correction of major leaks controlled EF 0.106 kg/Mg Secondary wastewater biotreatment uncontrolled EF 0.002-0.06 kg/Mg

Continued on next page ...

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Study Citation: U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.
HERO ID: 7325487
Conditions of Use: Domestic Manufacture

EVALUATION

Domain	Metric	Rating	Comments
Waste treatment methods and pollution control:	The use of either the absorber/stripper combination or therefrigerated condenser which reduces emissions is considered an integral part of the process design of some EDC production facilities. Somewhat higher oxychlorination and chlorination pressures are also reported to help lower EDC emissions.Many plants incinerate vent gases from the oxychlorination and direct chlorination reactors to reduce atmospheric emissions of EDC and VCM. This includes plants using the air-based as well as the oxygen-based oxychlorination processes, although in air units a much larger incinerator must be used because of high levels of nitrogen in the oxychlorination vent. Thermal oxidation is estimated to reduce EDC emissions by 98 percent or more. Incineration destruction efficiency varies with emission stream properties and incinerator operating parameters. The 98 percent efficiency level is based on incinerator operation at 870°C and 0.75 second residence time for a compound that is difficult to incinerate. The emission reduction may be greater than 98 percent for incineration of EDC with these operating parameters. In addition, the efficiency may be higher for longer residence times or higher operating temperatures. Catalytic incineration is used by one plant to reduce EDC emissions from reactor vents by 92.2 percent. Refrigerated vent condensers may also be used to control direct chlorination vent emissions, as reported by one EDC producer.Emissions from storage may be controlled by the use of refrigerated vent condensers. The control efficiency for a refrigerated condenser is dependent on the properties of the uncontrolled emission stream and on the condenser operating parameters. The 85 percent efficiency level for storage vents is based on an uncontrolled emission temperature of 20°C and a condenser operating temperature of -15°C. Greater efficiency can be achieved by using a lower operating temperature.Oxychlorination - Air process - Absorber/stripper with thermal Oxidizer 98+% reductionOxychlorination - Air process - Absorber/stripper with catalytic oxidizer 92.2% reductionOxychlorination - Air process - Absorber/stripper with thermal oxidizer 98+% reductionOxychlorination - Oxygen process with thermal oxidizer 98+% reduction Direct chlorination vent with refrigerated condenser 85% reduction Direct chlorination vent with thermal oxidizer 98+ % reduction Direct chlorination vent with refrigerated condenser 86% reduction Column vents with thermal oxidizer 98+% reduction Storage vents in-process with thermal oxidizer 98+% reduction Storage vents in-process with refrigerated condenser 85% reduction Storage vents product with thermal oxidizer 98+% reduction Storage vents product with refrigerated condenser 85% reduction Process fugitive with detection & correction of major leaks 72% reduction		

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High US EPA study
Domain 2: Representativeness	Metric 2:	Geographic Scope	High US
	Metric 3:	Applicability	High The report is for an occupational scenario (EDC production) within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low 1984 - more than 20 years old
	Metric 5:	Sample Size	Low Distribution of samples is qualitative or characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low The report does not address variability or uncertainty.

Overall Quality Determination**Medium**

Study Citation:	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.			
HERO ID:	7325487			
Conditions of Use:	Processing as a reactant: Intermediate in all other basic organic chemical manufacture			
EXTRACTION				
Parameter	Data			
Description of release source:	Methyl Chloroform productionFor the methyl chloroform production process from the vinyl chloride method, two major sources of EDC emissions to the atmosphere from the vinyl chloride method are: the hydrochlorinator vent and the steam stripper gas effluent. The emissions of EDC may result from the presence of EDC as an impurity in vinyl chloride or the production of EDC in the hydrochlorination and chlorination reactions.			
Release or emission factors:	For the methyl chloroform production process from the vinyl chloride method, emission factors for EDC emissions from the hydrochlorinator vent condenser and the steam stripper vent condenser are 8.5 kg/Mg and 0.5 kg/Mg, respectively. The emission factors refer to kg of EDC emitted per Mg of methyl chloroform produced.			
Waste treatment methods and pollution control:	For the methyl chloroform production process from the vinyl chloride method, One methyl chloroform producer is reported to incinerate gases in the hydrochlorinator vent. This would reduce EDC losses by at least 98 percent.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	US EPA study
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US
	Metric 3:	Applicability	High	The report is for an occupational scenario (methyl chloroform production) within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	1984 - more than 20 years old
	Metric 5:	Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation: U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.
HERO ID: 7325487
Conditions of Use: Processing as a reactant: Intermediate in plastic material manufacture

EXTRACTION

Parameter	Data
Description of release source:	Vinyl Chloride production–EDC dehydrochlorination process, for the vinyl chloride production, losses of EDC to the environment can occur in the heavy ends from the vinyl chloride separation unit. The heavy ends usually are incinerated along with other solid wastes generated by the VCM manufacturing process. Fugitive and process vent emissions of EDC from VCM production are expected to be minor because of control measures which are taken to prevent emissions of vinyl chloride. VCM production plants may vary in configuration and level of control. The reader is encouraged to contact plant personnel to confirm technology at a particular facility prior to estimating emissions therefrom.
Release or emission factors:	For vinyl chloride production, uncontrolled EDC emissions from the heavy ends stream are reported as 0.6 - 0.8 kg/Mg.
Waste treatment methods and pollution control:	Assuming that a removal efficiency of at least 98 percent is achieved by VCM incineration, the controlled emission factor for EDC would be < 0.016 kg of EDC per Mg of vinyl chloride produced.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	US EPA study
Domain 2: Representativeness	Metric 2: Geographic Scope	High	US
	Metric 3: Applicability	High	The report is for an occupational scenario (vinyl chloride production) within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	1984 - more than 20 years old
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range but uncertain statistics are not provided. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.

Overall Quality Determination**Medium**

Study Citation:	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.			
HERO ID:	7325487			
Conditions of Use:	Processing as a reactant: Intermediate in all other basic organic chemical manufacture			
EXTRACTION				
Parameter	Data			
Description of release source:	Ethyleneamine production: reactor pressure vents, dehydration columns, and fractionating (distillation) columns are possible sources of unreacted EDC emissions. Waste water streams from dehydrochlorination and drying operations may contain quantities of unreacted EDC.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	US EPA study
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US
	Metric 3:	Applicability	High	The report is for an occupational scenario (ethyleneamine production) within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	1984 - more than 20 years old
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range but uncertain statistics are not provided. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.
HERO ID:	7325487
Conditions of Use:	Processing as a reactant: Intermediate in all other basic organic chemical manufacture

EXTRACTION

Parameter	Data
Description of release source:	Trichloroethylene productionPotential sources of EDC process emissions for the EDC chlorination process are the neutralization and drying area vent, which releases inert gases from the chlorine and EDC feeds, and the distillation column vents, which release noncondensable gases. Storage emission sources include raw material storage and recycle storage. Fugitive emissions (D) occur when leaks develop in valves or in pump seals. When process pressures are higher than the cooling-water pressure, VOCs can leak into the cooling water and escape as fugitive emissions from the quench area. Secondary emissions can occur when wastewater containing VOCs is sent to a wastewater treatment system or lagoon and the VOCs evaporate (E). Another source of secondary emissions is the combustion of tars in the incinerator where VOCs are emitted with the flue gases.In the EDC oxychlorination process, the hydrogen chloride asbsorber vent, which releases the inert gases from the oxygen, chlorine, and hydrogen chloride feeds, is a potential source of EDC process emissions. Other potential sources of EDC process emissions are the drying column vent and the distillation column vents, which release primarily noncondensable gases, and the TCE and the PCE neutralizer vents, which relieve excess pressure of the nitrogen pads on the systems. Storage emission sources are raw material storage and recycle storage. Fugitive emissions occur when leaks develop in valves or in pump seals. Secondary emissions occur as described above for the chlorination process.
Release or emission factors:	Trichloroethylene productionThe emission factor for the controlled EDC emissions from the production of TCE can be calculated by dividing the EDC emissions by 90 percent of the total TCE production quantity. From these values, the controlled emission factor is about 5.0 kg of EDC per Mg of TCE produced. Data are not available on the derivation of the total annual EDC emissions estimate, nor are sufficient data available to break down EDC emissions between various sources. One reference states that EDC emissions for the process as a whole are practically zero when volatiles are recovered from the hex wastes and since EDC conversion is 100 percent in the reactor. TCE production plants may vary in configuration and level of control. The reader is encouraged to contact plant personnel to confirm the existence of emitting operations and control technology at a particular facility prior to estimating emissions therefrom.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	High	US EPA study
Domain 2: Representativeness			
	Metric 2: Geographic Scope	High	US
	Metric 3: Applicability	High	The report is for an occupational scenario (Trichloroethylene production) within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	1984 - more than 20 years old
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range but uncertain statistics are not provided. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity			
	Metric 6: Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty			
	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.

Overall Quality Determination**Medium**

Study Citation:	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.
HERO ID:	7325487
Conditions of Use:	Processing as a reactant: Intermediate in all other basic organic chemical manufacture

EXTRACTION

Parameter	Data
Description of release source:	Perchloroethylene Production (PCE) The majority of emissions were from EDC oxychlorination and chlorination. Emissions estimate corresponds to a controlled EDC emission factor for EDC chlorination and oxychlorination of about 5.0 kg of EDC per Mg of PCE produced. One reference states that EDC emissions for the process as a whole are practically zero when the volatiles are recovered from the hex wastes and since EDC conversion is 100 percent in the reactor. Since EDC is not used as a feedstock in the hydrocarbon chlorinolysis process, the only emissions of EDC can result from the handling and disposal of hex wastes from the PCE distillation column. The EDC is produced in the chlorinolysis reaction.
Release or emission factors:	Perchloroethylene Production (PCE) The uncontrolled EDC emission factor for the hex waste handling is about 0.026 kg of EDC per Mg of PCE and carbon tetrachloride produced.
Waste treatment methods and pollution control:	Perchloroethylene Production (PCE) Hex wastes may be processed further or heated to recover more volatilizable materials, with the resulting tars sent to disposal. This additional step recovers 80 to 90 percent of the bottoms, and the EDC emissions from the dumping of the hex wastes are essentially zero. Alternatively, a vapor-balance system and refrigerated condenser have been used to control emissions from hex wastes with an emission reduction of approximately 99 percent. Thus, the controlled EDC emission factor for the secondary emissions is 0.00026 kg of EDC per kg of PCE and carbon tetrachloride produced. These EDC emission factors were developed for a hypothetical plant with the capacity to produce 50,000 Mg/yr PCE and 30,000 Mg/yr carbon tetrachloride operating 8760 hours per year.

EVALUATION

Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	US EPA study
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US
	Metric 3:	Applicability	High	The report is for an occupational scenario (Perchloroethylene Production) within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	1984 - more than 20 years old
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range but uncertain statistics are not provided. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.

Overall Quality Determination**Medium**

Study Citation:	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.			
HERO ID:	7325487			
Conditions of Use:	Processing as a reactant: Intermediate in all other basic organic chemical manufacture			
EXTRACTION				
Parameter	Data			
Description of release source:	Ethyl chloride production Emissions may occur from process air vents.			
Release or emission factors:	Ethyl chloride production The EDC emission factor for ethyl chloride production was calculated to be 9.45 kg/Mg. Ethyl chloride production plants may vary in configuration and level of control. The reader is encouraged to contact plant personnel to confirm the existence of emitting operations and control technology at a particular facility prior to estimating emissions therefrom.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	US EPA study
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US
	Metric 3:	Applicability	High	The report is for an occupational scenario (Ethyl chloride production) within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	1984 - more than 20 years old
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range but uncertain statistics are not provided. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.			
HERO ID:	7325487			
Conditions of Use:	Processing as a reactant: Intermediate in all other basic organic chemical manufacture			
EXTRACTION				
Parameter	Data			
Description of release source:	Vinylidene chloride productionThe primary source of emissions from the EDC chlorination process are the waste streams from the HCl scrubber. Waste water streams may contain chlorine, HCl, spent caustic, and various chlorohydrocarbons, including EDC, trichloroethane and reaction byproducts. Hydrogen chloride and a number of organic chlorides are probably present in the waste gas.Emissions from the EDC oxychlorination process originate from waste water and vent gases from the separator which contain a number of chlorohydrocarbons, including EDC, trichloroethane, and byproducts. Scrubbing of the crude product to remove unreacted acid is another source of waste water which may contain EDC Potential sources of EDC emissions for the dehydrochlorination of 1,1,2-trichloroethane are the dehydrochlorination reactor purge vent and the distillation column vents, which release noncondensable gases. Secondary EDC emissions can occur from desorption of VOCs during wastewater treatment.			
Release or emission factors:	Vinylidene chloride productionThe controlled EDC emission factor for vinylidene chloride production is calculated to be 5.7 kg of EDC per Mg of vinylidene chloride produced. Data are not available on the derivation of the annual EDC emissions estimate for vinylidene chloride production, nor are sufficient data available to break down EDC emissions between specific emission points. Vinylidene chloride production plants may vary in configuration and level of control. The reader is encouraged to contact plant personnel to confirm the existence of emitting operations and control technology at a particular facility prior to estimating emissions there from.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	US EPA study
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US
	Metric 3:	Applicability	High	The report is for an occupational scenario (Vinylidene chloride production) within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	1984 - more than 20 years old
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range but uncertain statistics are not provided. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.			
HERO ID:	7325487			
Conditions of Use:	Processing as a reactant: Intermediate			
EXTRACTION				
Parameter	Data			
Description of release source:	Polysulfide rubber production Based on yields for similar industrial chemical reactions it has been estimated that 94 percent of the EDC used during the manufacturing of polysulfide rubber becomes incorporated in the end product. It is estimated that 5 percent of the EDC used in the process is released to the atmosphere via leaks, spills and fugitive emissions associated with the overall polysulfide manufacturing process. The remaining 1 percent of EDC remains dissolved in the mother liquor from which the polymer is produced. The mother liquor may be discharged as solid waste and stored in landfills.			
Release or emission factors:	Polysulfide rubber production From the stoichiometry of the polysulfide production reaction and the percentages of EDC consumed and emitted, the average controlled EDC emission factor for polysulfide rubber manufacture is 33.8 kg of EDC per Mg of polysulfide rubber produced.			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Methodology	High	US EPA study
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US
	Metric 3:	Applicability	High	The report is for an occupational scenario (Polysulfide rubber production) within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	1984 - more than 20 years old
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range but uncertain statistics are not provided. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	ATSDR, (2001). Toxicological profile for 1,2-dichloroethane.			
HERO ID:	412348			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Manufacturing U.S. production totals for 1,2-dichloroethane in 1984, 1985, 1986, 1990, 1992, 1993, and 1994 were 7.3, 12.1, 12.9, 13.8, 15.2, 17.9, and 16.8 billion pounds (Pg. 177). In 1996, 2.5 billion pounds of 1,2-dichloroethane were exported while 316 million pounds were imported to the United States (Anonymous 1998).			
Number of sites:	16			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for manufacturing, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by multiple years of production values but uncertainty is not addressed.	
Overall Quality Determination		Medium		

Study Citation:	EC, (1994). Priority substances list assessment report: 1,2-dichloroethane.			
HERO ID:	5160047			
Conditions of Use:	Processing as an intermediate			
EXTRACTION				
Parameter	Data			
Production, import, or use volume: Throughput:	Canadian production: 922 (kt) (1992). US production 6,318 kt (1991) (Pg. 10) pg 10: In 1991, the total production of 1,2-dichloroethane in the United States was 6318 kt where it was used primarily for the synthesis of vinyl chloride monomer (approximately 88%), and in the synthesis of other chlorinated solvents and ethyleneamines (2%) (Chemical Marketing Reporter, 1992). In 1991, the United States imported and exported approximately 5 and 659 kt, of 1,2-dichloroethane, respectively.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Canada, an OECD country.
	Metric 3:	Applicability	High	Data are for processing as an intermediate, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	Hughes, K. (1995). No. 176. 1,2-dichloroethane.		
HERO ID:	5447627		
Conditions of Use:	Manufacture		
Parameter		EXTRACTION	
Production, import, or use volume:		6,318,000 (lbs) (1991) (Pg. 15)	
Chemical concentration:		97-99% pure (Pg. 15)	
Domain		EVALUATION	
Metric		Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	Medium	Assessment uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	Data are from the U.S.
Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
Metric 5:	Sample Size	Low	Sample distribution is described qualitatively.
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Low	

Study Citation:	NTP, (1978). Bioassay of 1,2-dichloroethane for possible carcinogenicity.			
HERO ID:	5441108			
Conditions of Use:	Various			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	According to the U.S. International Trade Commission (1976) 9 approximately 9.2 x 10 pounds of 1,2-dichloroethane were produced in the United States in 1974			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Medium	Worker number estimates cover a range of COUs
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	OECD, (2009). Emission scenario documents on coating industry (paints, lacquers and varnishes).		
HERO ID:	3827298		
Conditions of Use:	Formulation of Coatings and Use of Coatings		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	3.2 million tonnes coating/yr		
Process description:	PROC: Dispersion, milling, finishing, filling USE: Application via roller/brush, air spray systems, airless and air-assisted airless spray systems, electrostatic spray, electrodeposition/electrocoating and autodeposition, dip coating, flow and curtain coating, roll coating, and supercritical carbon dioxide coating systems		
Throughput:	0.62-9.0 l/vehicle (auto refinishing); 1.1-5.1 g coating/can (metal can coating sites)		
Number of sites:	60,330 automotive application sites; 33 metal coating application sites		
Chemical concentration:	Provides conc. estimates based on the chemical function, not chemical specific.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	This ESD was not developed by EPA, but another OECD-member country.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple chemical functions and coating types
Overall Quality Determination		High	

Study Citation:	OECD, (2009). Emission scenario document on adhesive formulation.			
HERO ID:	3827299			
Conditions of Use:	Adhesives and sealants			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	15.8-4,990 million kg adhesive/yr			
Process description:	Unloading raw materials from containers into mixing vessel, mixing, packaging/on-site storage			
Throughput:	Provides methodology for estimating throughput based on the amount of adhesive produced, and the concentration of the chemical in the adhesive			
Number of sites:	Provides methodology for estimating number of sites based on chemical PV, the adhesive use rate, and the concentration of the chemical in the adhesive formulation			
Chemical concentration:	Provides conc. estimates based on chemical function, not chemical specific.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions and types of adhesives.	
Overall Quality Determination		High		

Study Citation:	OECD, (2013). Emission scenario document on the industrial use of adhesives for substrate bonding.			
HERO ID:	3827300			
Conditions of Use:	Adhesives and sealants			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	1,500 - 9,100,000 kg adhesive/site-yr			
Process description:	Unloading, dilute and mix (optional), application (roll, spray, curtain, bead/syringe), drying/curing, product finishing			
Throughput:	Provides methodology for estimating throughput based on the amount of adhesive used, and the concentration of the chemical in the formulation.			
Number of sites:	541-22,294			
Chemical concentration:	Provides conc. estimates based on chemical function and adhesive type, not chemical specific.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This ESD was developed by EPA based on U.S. data
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions, types of adhesives, and end use markets.
Overall Quality Determination			High	

Study Citation:	OECD, (2010). Emission scenario document on formulation of radiation curable coatings, inks and adhesives.			
HERO ID:	3840003			
Conditions of Use:	Formulation of Coatings, inks, and adhesives			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	0.7-69.84 million kg coating/ink/adhesive/yr			
Process description:	Preheating (optional), Unloading raw materials from containers into mixing kettle, mixing, filtering, packaging			
Throughput:	Provides methodology for estimating throughput based on the amount of product produced, and the concentration of the chemical in the formulation			
Number of sites:	Provides methodology for estimating number of sites based on chemical PV, the use rate, and the concentration of the chemical in the formulation			
Chemical concentration:	Provides conc. estimates based on chemical function, not chemical specific.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This ESD was developed by EPA based on U.S. data
	Metric 3:	Applicability	Medium	The assessment is for an occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, in terms of the type of industry, operations, and work activities.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions and types of UV curable products.
Overall Quality Determination		Medium		

Study Citation:	OECD, (2009). Emission scenario document on plastic additives.		
HERO ID:	5079084		
Conditions of Use:	Plastic material and resin manufacturing		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	Provides % of polymers used for various end-use applications		
Process description:	Provides descriptions for a variety of closed, partially open, and open compounding and converting processing. Including the following compounding processes: tumbling, ball blending, gravity mixers, paddle mixers, intensive vortex mixers, banbury mixers, two roll mills, and extruder mixing. And the following converting processes: extrusion, injection molding, compression molding, extrusion blow molding, injection blow molding, film extrusion, extrusion coating, thermoforming, calendering, hand lay up, spray techniques, and filament winding. ESD also provides a break down of the % and volume of polymers used in each process in the UK.		
Throughput:	Provides methodology for estimating throughput of polymers and additives		
Number of sites:	4000 sites in UK		
Chemical concentration:	Provides conc. estimates based on additive function in various plastics, not chemical specific.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	This ESD was not developed by EPA, but another OECD-member country.
	Metric 3: Applicability	Medium	Data are for multiple in-scope occupational scenarios; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Low	Assessment from 2009 but is based on data greater than 20 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering prevalence of various processing methods, additive functions, and plastics.
Overall Quality Determination		Medium	

Study Citation:	OECD, (2002). SIDS initial assessment report: 1,2-dichloroethane. :203.		
HERO ID:	5160031		
Conditions of Use:	Manufacture		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	1,000,000+ (tonnes/year worldwide) (Pg. 14)		
Number of sites:	14 (Europe) (Pg. 14)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Germany, an OECD country.
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium	

Study Citation:	OECD, (2011). Emission scenario document on the chemical industry.			
HERO ID:	6306753			
Conditions of Use:	Manufacture, processing, use			
EXTRACTION				
Parameter	Data			
Process description:	General synthesis process consists of reaction, handling/transportation, isolation, handling/transportation, purification, handling/transportation, then either reaction to make another chemical or on to the next life cycle stage			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	This ESD was not developed by EPA, but another OECD-member country.
	Metric 3:	Applicability	Medium	Data are for multiple in-scope occupational scenarios; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Low	Assessment from 2011 but is based on data greater than 20 years old.
	Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted (process description only)
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted (process description only)
Overall Quality Determination		Medium		

Study Citation:	OECD, (2012). Emission scenario document on chemicals used in oil well production.			
HERO ID:	6387322			
Conditions of Use:	Fuels and related products			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	703-112,875 bbl/well-yr			
Process description:	Container unloading, storage, pumped into oil well, extracted, temporary storage tank or separation process, natural gas processing/refinery/disposal			
Throughput:	1.29-3.86 million bbl oil/day			
Number of sites:	Provides methodology to estimate number of sites based on chemical production volume, oil production rate, and operating days			
Chemical concentration:	Provides conc. estimates based on chemical function, not chemical specific.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering on- and off-shore wells and chemical functions.	
Overall Quality Determination		High		

Study Citation:	OECD, (2009). Emission scenario document on transport and storage of chemicals.			
HERO ID:	6393282			
Conditions of Use:	Transportation and Storage			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Rail tankers are used for the bulk transport of chemicals within the United Kingdom, with an estimated 11 million tonnes of petroleum products and chemicals transported by this method in the UK in 2003. Pipelines are usually used for the transport of petrol, diesel and jet fuel and around 30 million tonnes of products are transported this way each year in the UK.			
Process description:	On-site storage of chemicals, filling of containers, transport to distributors/downstream users/consumers, containers with residual chemical transported to recycling/cleaning or disposal site, empty/cleaned containers returned to distributor or production site			
Number of sites:	Container cleaning sites in UK: 40 for road tankers; 8 for steel drums; 8 for plastics drums; 6 for fibre drums; 13 for IBCs; 7 for hazardous waste containers			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	This ESD was not developed by EPA, but another OECD-member country.	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple chemical forms, containers and storage system types.	
Overall Quality Determination		Medium		

Study Citation:	Stantec ChemRisk, (2024). Final study report: Inhalation monitoring of 1,2-dichloroethane (CASRN 107-06-2) with cover letter.			
HERO ID:	11854585			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Production capacity for the representative facilities was classified into two groups, Group 1 representing those with an annual EDC production capacity of less than 2.5 billion pounds and Group2 representing those with greater than 2.5 billion pounds in annual EDC production (page 13 of 260). Both capacity groups were included in the inhalation sampling plan to characterize the lower and higher end of worker exposure potential as it relates to the influence of production volume.			
Process description:	Chlorination of ethylene in the gaseous phase using anhydrousHCl and cupric chloride catalyst (fluid or fixed bed technology)... (Process summaries for each facility type are listed in Table 2, page 16 of 260)			
Throughput:	Table 2 on page 16 of 260 has flow rate of unit operations for different facilities which range from 75 to 192k kg/hr			
Number of sites:	Nine facilities were sampled in this test order (page 12 of 260)			
Chemical concentration:	Table 2 on page 16 of 260 includes weight fraction of EDC on process, which ranges from 0.8 to 100%.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed by discussing lab validation and calibration methods. Variability addressed by describing variability within the similar exposure groups and variability in worker schedules.
Overall Quality Determination			High	

Study Citation:	Stantec ChemRisk, (2024). Final study report: Inhalation monitoring of 1,2-dichloroethane (CASRN 107-06-2) with cover letter.			
HERO ID:	11854585			
Conditions of Use:	Processing as a Reactant			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Production capacity for the representative facilities was classified into two groups, Group 1 representing those with an annual EDC production capacity of less than 2.5 billion pounds and Group2 representing those with greater than 2.5 billion pounds in annual EDC production. Both capacity groups were included in the inhalation sampling plan to characterize the lower and higher end of worker exposure potential as it relates to the influence of production volume. (page 13 of 260)			
Throughput:	Flowrate is 1,973 kg per hour. (page 16 of 260)			
Number of sites:	One site is included in the test order			
Chemical concentration:	99.80% (table 2, page 16 of 260)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for processing as a reactant, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed by discussing lab validation and calibration methods. Variability addressed by describing variability within the similar exposure groups and variability in worker schedules.
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2023). Use of laboratory chemicals - Generic scenario for estimating occupational exposures and environmental releases (Revised draft generic scenario).			
HERO ID:	10480466			
Conditions of Use:	Laboratory Chemicals			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Provides methodology to estimate annual use rate.			
Process description:	Receive chemicals, weigh or measure chemical, add chemical to labware, dilute/add other laboratory chemicals, add sample, run analytical testing, dispose of sample and laboratory chemical waste.			
Throughput:	255 grams reagent/site-day (average); 2,000 mL reagent/site-day (average); Table 3-2 gives daily throughput for laboratory stock solutions.			
Number of sites:	Provides methodology to estimate number of sites based on chemical production volume, annual throughput - 40,639 total establishments.			
Chemical concentration:	Provides conc. estimates based on the chemical function, not chemical specific.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality information/data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering different chemical functions	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2014). Generic scenario draft on the use of additives in plastic compounding.		
HERO ID:	3827195		
Conditions of Use:	Plastic and Rubber Products		
EXTRACTION			
Parameter	Data		
Process description:	Polymer pellets/resins received, blending/compounding into masterbatch, extrusion/shaping, packaging.		
Throughput:	Provides methodology for estimating throughput based on the amount of plastic produced, and the concentration of the chemical additive in the plastic.		
Number of sites:	Provides methodology for estimating number of sites based on chemical PV, the amount of plastic produced, and the concentration of the chemical additive in the plastic.		
Chemical concentration:	Provides conc. estimates based on additive function in various plastics, not chemical specific.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data.
	Metric 3: Applicability	Medium	Data are for multiple in-scope occupational scenarios; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic and additive types.
Overall Quality Determination		High	

Study Citation:	U.S. EPA, (2004). Use of additives in foamed plastics – generic scenario for estimating occupational exposures and environmental releases – Draft.			
HERO ID:	6304171			
Conditions of Use:	Flexible and rigid polyurethane foam manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	2,365 million lbs polurethane foam/yr6,442 million lbs polysytrene/yr.			
Process description:	Converters mix plastic resins with additives, shaping/molding.			
Number of sites:	566 total polystyrene sites, 610 total polyurethane foam sites.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data.
	Metric 3:	Applicability	Low	COU is similar to an occupational scenario within the scope
	Metric 4:	Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple foam types.
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2004). Additives in plastics processing (compounding) – generic scenario for estimating occupational exposures and environmental release – Draft.			
HERO ID:	6311218			
Conditions of Use:	Plastics compounding			
EXTRACTION				
Parameter	Data			
Process description:	Polymer pellets/resins received, blending/compounding into masterbatch, extrusion/shaping, packaging.			
Throughput:	Provides methodology for estimating throughput based on the amount of plastic produced, and the concentration of the chemical additive in the plastic			
Number of sites:	Provides methodology for estimating number of sites based on chemical PV, the amount of plastic produced, and the concentration of the chemical additive in the plastic.			
Chemical concentration:	Provides conc. estimates based on additive function in various plastics, not chemical specific.			
Comments:	Generic Scenario. Not specific to 1,2-Dichloroethane.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data
	Metric 3:	Applicability	Uninformative	The assessment is from an occupational or non-occupational scenario that does not apply to any occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic and additive types.
Overall Quality Determination		Uninformative		

Study Citation:	U.S. EPA, (2003). Transportation equipment cleaning - Generic scenario for estimating occupational exposures and environmental releases (draft).			
HERO ID:	6385708			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	EPA estimates 500,000 IBCs are cleaned annually in the United States. Of this amount, EPA believes 225,000 IBCs are cleaned by Transportation Equipment Cleaning facilities. The remaining 275,000 IBCs are cleaned by drum reconditioning facilities.			
Process description:	Cleaning process generally include reviewing manifests, draining the tank heel, rinsing, washing or using material-specific cleaning methods, rinsing a second time, and drying. Cleaning processes vary between facilities depending on the available cleaning equipment and the commodities last transported in the tanks to be cleaned.			
Throughput:	IBCs are portable plastic and metal containers with 450 liters (199 gallons) to 3,000 liters (793 gallons) capacity. Cleaning time for tank barges typically ranges from four to eight hours. On average, tank trucks, IBCs, or intermodal tank containers requires two hours for cleaning.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality information/data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data
	Metric 3:	Applicability	Medium	Data are for multiple in-scope occupational scenarios; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Sample distributions characterized by ranges/estimations with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple container types and cleaning methods.
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2014). Use of additives in the thermoplastic converting industry - generic scenario for estimating occupational exposures and environmental releases.			
HERO ID:	6385711			
Conditions of Use:	Plastic material and resin manufacturing			
EXTRACTION				
Parameter	Data			
Process description:	Compounded resins received, unloaded, forming/molding/shaping, trimming, finishing (including coating operations).			
Throughput:	Provides methodology for estimating throughput based on the amount of plastic produced, and the concentration of the chemical additive in the plastic. 137(average)-254 days/yr.			
Number of sites:	Provides methodology for estimating number of sites based on chemical PV, the amount of plastic produced, and the concentration of the chemical additive in the plastic.			
Chemical concentration:	Provides conc. estimates based on additive function in various plastics, not chemical specific.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data.
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic and additive types.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2004). Additives in plastics processing (converting into finished products) -generic scenario for estimating occupational exposures and environmental releases. Draft.
HERO ID:	6549571
Conditions of Use:	Additives in Plastics Processing (Converting into Finished Products)

EXTRACTION

Parameter	Data
Production, import, or use volume:	Table 2 presents the types of thermoplastic resins, common uses, and 2003 production volume.
Life cycle description:	The plastic manufacturing industry can be divided into four sections: polymer manufacturing, compounding, converting, and “in-house” manufacturing. This generic scenario will address converting operations. Polymer manufacturing will not be included in this scenario. Compounders produce masterbatches of plastic resins with specific properties by blending the polymer (resin), additives, fillers, and reinforcements. Converters receive the masterbatch of plastic resin from compounders and form finished plastic products. Compounding and converting may take place at the same facility (“in-house” manufacturing) or at separate facilities. This scenario assumes that compounding and converting take place at separate facilities; therefore, in-house manufacturing is not covered in this scenario.
Process description:	Various plastic processing operation descriptions are provided in Table 5, and a Process Diagram is provided on PDF pg. 10. More generally, polymer resin is received at the compounding sites from the resin manufacturer in the form of pellets. A compounding site blends the resin and additives to produce a masterbatch. The converting site then processes the masterbatch by shaping the plastic into the desired form for the final plastic product. The blending and forming may take place at the same facility (“in house” manufacturing) or separate facilities. As a conservative estimate, it is assumed that the compounding of the plastic resin and the converting of the resin into plastic products take place at separate facilities. Therefore, in-house manufacturing is not covered in this scenario. After shaping, finishing operations such as filing, grinding, sanding, polishing, painting, bonding, coating, engraving etc. are performed to complete the finished plastic product. This scenario covers the converting of plastic resins into finished products.
Throughput:	Daily use rate = amount of resin / # converting sites / days of operation x fraction of additive x fraction of chemical in additive
Number of sites:	Overall, there were 12,191 Plastic Product Manufacturing establishments in 2001. Table 1 provides Number of Establishments for subcategories of NAICS 3261 Plastic Product Manufacturing.
Chemical concentration:	Default values used to represent the weight fraction of various additives in plastic resin range from 0.001 - 0.5. These values are provided in Table 2 and Table 3.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment uses high quality data that are from a frequently used source are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3: Applicability	Medium	The assessment is for an occupational scenario within the scope of the risk evaluation. However, data is not chemical specific.
	Metric 4: Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity			

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Study Citation:	U.S. EPA, (2004). Additives in plastics processing (converting into finished products) -generic scenario for estimating occupational exposures and environmental releases. Draft.			
HERO ID:	6549571			
Conditions of Use:	Additives in Plastics Processing (Converting into Finished Products)			
EVALUATION				
Domain	Metric	Rating	Comments	
	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Medium	Variability is addressed by evaluation of various plastic processing operations, as well as various additive fractions. However, uncertainty associated with data are not characterized.
Overall Quality Determination			Medium	

Study Citation:	ACA, (2019). Comment submitted by Raleigh Davis, Assistant Director and Riaz Zaman, Counsel, Government Affairs, American Coatings Association (ACA) regarding the proposed 20 high priority candidates for chemical risk evaluation.			
HERO ID:	10369850			
Conditions of Use:	Adhesives and Sealants			
EXTRACTION				
Parameter	Data			
Chemical concentration:	1,2-Dichloroethane is found as an impurity in some adhesives in amounts less than 0.1%. [PDF Pg. 6]			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for adhesives and sealants, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.Sample distribution is characterized by no statistics.All data sources, methods, re- sults, and assumptions are clearly documented.Variability and uncertainty are not ad- dressed.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			High	

Study Citation:	Anonymous (1997). Tenders out for Qatar ethylene dichloride project. Chemical Week 159(40):30.			
HERO ID:	5441338			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:				
Qatar Vinyl, a joint venture of Qatar General Petroleum, Qatar Petrochemical, Norsk Hydro, and Elf Atochem, has issued tender documents inviting contractors to submit proposals for an ethylene dichloride (EDC) complex planned in Umm Said. The \$500-million project will include facilities for the production of 340,000 m.t./year of EDC.				
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	The assessment or report uses high quality data and/or techniques or sound methods that are not from a frequently used source and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	The data are from Qatar, a non-OECD country
	Metric 3:	Applicability	Low	Report is for potential construction of EDC production plant, and therefore, provides theoretical production rate only.
	Metric 4:	Temporal Representativeness	Low	The report is more than 20 years old.
	Metric 5:	Sample Size	N/A	Data is potential production rate, no sampling possible.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	Variability and uncertainty are not relevant to data.
Overall Quality Determination			Low	

Study Citation:	Anonymous, (2002). Hungarian dichloroethane project for Uhde. Focus on Polyvinyl Chloride 2002(8):7.			
HERO ID:	5447086			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	225,000 (tonnes/year) (50% of world production)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality methods that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Hungary, an OECD country.
	Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	Anonymous, (1979). Canadian petroleum guide to canadian petrochemical plants. Canadian Petroleum 20(4):21.			
HERO ID:	5708674			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Throughput:	9,000 tonnes annual capacity for single site (pg 4)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
	Metric 3:	Applicability	High	Data are for manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	annual capacity data for specific site
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Low	

Study Citation:	ATSDR, (1996). Toxicological profile for 1,2-dichloroethene.
HERO ID:	723873
Conditions of Use:	Domestic Manufacture

EXTRACTION	
Parameter	Data
Production, import, or use volume:	Current production and import/export volumes and usage data are presently unavailable in the literature. Much of the information regarding 1,2dichloroethene may be difficult to obtain because many manufacturing companies maintain confidentiality. In 1977, the estimated production of cis-1,2-dichloroethene was 500 metric tons. No information was available for the trans isomer or for the mixture
Process description:	1,2-Dichloroethene has been produced as a commercial end product by the direct chlorination of acetylene at about 40 °C or by a technique involving the dehydrochlorination of 1,1,2-trichloroethane at 500 °C. Industrial quantities of 1,2-dichloroethene are produced for on-site use in the production of other chlorinated compounds, which are the final commercial product.
Number of sites:	12
Chemical concentration:	Leachate concentrations- Landfill with mixed industrial waste 45-800 ppb Trans (average concentration)- Minnesota 1.4 -470 ppb Cis / 3.-88 ppb Trans- Lyon MN Municipal landfill 3.8 ppb Trans (mean)- Meeker MN Municipal landfill 190 ppb Cis (mean) / 170 ppb Trans (mean)-Rochester MN, Municipal landfill 470 ppb Cis (mean) / 88 ppb Trans (mean)- Wisconsin 20 municipal and industrial landfills 310 ppb (1985-87)Industrial wastewater - Coal mining 10 ppb Trans (max)- Electronic components 46 ppb Trans (max)- Foundries 10 ppb Trans (max)- Pharmaceutical manufacture 10 ppb Trans (max)- nonferrous metals manufacture 75 ppb Trans (max)- Organic chemicals and plastics 12 ppb Trans (mean)- Paint and Ink formulations 190 ppb Trans (max)- Petroleum refining <10 ppb Trans (max)- Rubber processing 290 ppb Trans (max)- Steam electric 1.6 ppb Cis - Leather tanning 3.3 ppb Cis- Iron & Steel Manufacture 1400.8 ppb Cis (median)/ 2265.9 ppb Trans (median)- Non ferrous metal 314.6 ppb Cis - Organics and Plastics 121.5 ppb Cis (median) / 14.6 Trans (median)- Inorganic chemicals 3.9 ppb Trans- Textile Mill 8.3 ppb Cis- Plastics and synthetics 20.1 ppb Cis (median)- Rubber processing 712 ppb Cis / 19.0 ppb Trans (median)- Auto and Laundries 60.6 ppb Trans- Explosives 1.5 ppb Cis / 3.9 ppb Trans - Electronics 140.7 ppb Trans (median)- Mechanical products 13.7 ppb Trans (median)- Transportation equipment 29.3 ppb Trans- POTW 16.3 ppb Trans (median)- Metal Finishing 260 ppb Trans (mean) / 1700 ppb Trans (max) - Photographic supplies 2200 ppb Trans (max)- Non-ferrous metal manufacture 75 ppb Trans (mean) / 260 ppb Trans (max)- Rubber processing 150 ppb Trans (mean) / 290 ppb Trans (max)Municipal Sludge from various treatment plants 22-55 g/l
Comments:	See Table 4.1Table 5.3 for concentrations.

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	US Department of Health and Human Services
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US
	Metric 3:	Applicability	High	The report is for an occupational scenario (domestic manufacture) within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	1996 - more than 20 years old
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a singular values, mean, median or max values. Given the age of the data it is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.

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Study Citation:	ATSDR, (1996). Toxicological profile for 1,2-dichloroethene.		
HERO ID:	723873		
Conditions of Use:	Domestic Manufacture		
		EVALUATION	
Domain	Metric	Rating	Comments
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium	

Study Citation:	Author], [No (1997). Ethylene dichloride (vol 159, pg 30, 1997). Chemical Week 159(16):10.			
HERO ID:	5441345			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Capacity (in thousands of m.t./year): Dow Chemical - 3700, OxyChem - 2200, Formosa Plastics - 1800, Geon - 1600, Georgia Gulf - 1210, Oxymer - 1100, PPG Industries - 800, Condea Vista - 670, Westlake - 500, Borden Chemicals and Plastics - 435, Vulcan Chemicals - 200, PPG-Vista - 160 (p. 3)			
Number of sites:	12 individual manufacturing entities, however, number of sites/company is unknown.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	N/A (annual capacity and number of sites data)
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	Bertram, C. G. (1977). Minimizing emissions from vinyl chloride plants. Environmental Science & Technology 11(9):864.			
HERO ID:	5436554			
Conditions of Use:	Processing as an intermediate			
EXTRACTION				
Parameter	Data			
Process description:	Vent gas incinerator diagram given on Pg. 2			
Comments:	Process description is for loading containers			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Low	Report does not specify the data/methods used.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for processing as an intermediate, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	N/A - no samples.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Low		

Study Citation:	BMI, (2012). Turkey petrochemicals report Q3 2012.			
HERO ID:	1448261			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	In 2011, Turkey’s ethylene production capacity reached 600,000 tonnes per annum (tpa), providing feedstock for plants with capacities of 140,000tpa ethylene dichloride			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	The assessment or report uses high quality data and/or techniques or sound methods that are not from a frequently used source and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are for Turkey an OCED member country
	Metric 3:	Applicability	High	The report is for manufacturing, which is in-scope.
	Metric 4:	Temporal Representativeness	Medium	The data are for 2011
	Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	BMI, (2012). Spain petrochemicals report Q3 2012.		
HERO ID:	1449554		
Conditions of Use:	Manufacturing		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	For 2011: In the PVC chain, Spain has 750,000tpa ethylene dichloride,		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	The assessment or report uses high quality data and/or techniques or sound methods that are not from a frequently used source and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are for Spain and OECD member country
	Metric 3: Applicability	High	Manufacturing is in scope
	Metric 4: Temporal Representativeness	High	The data is for 2011
	Metric 5: Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium	

Study Citation:	BMI, (2011). Thailand petrochemicals report Q2 2011.			
HERO ID:	5436166			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	785,000 (tpa) production in Thailand from 2008-2015.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues. [Business Market Report]
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data are from Thailand, a non-OECD country.
	Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	The report is more than 10 years old but no more than 20 years old.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics. [single values for each year]
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent. [Not fully transparent - general description of methods provided in Methodology section]
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by presnting data for multiple years, but uncertainty is not addressed. [provides estimates from 2008-2015]
Overall Quality Determination			Low	

Study Citation:	BMI, (2011). Belgium petrochemicals report 2011.		
HERO ID:	5436168		
Conditions of Use:	Manufacturing		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	1,935,000 tpa ethylene dichloride production in 2008 through 2015 in Belgium (p. 31)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues. [Business Market Report]
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Belgium, an OECD country.
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old. 2008-2015
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by addressing multiple years but uncertainty is not addressed. Provides estimates from 2008-2015
Overall Quality Determination		Medium	

Study Citation:	BMI, (2010). Thailand petrochemicals report Q4 2010.		
HERO ID:	5451601		
Conditions of Use:	Manufacture		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	785,000 tpa ethylene dichloride production in 2008 through 2014 in Thailand (p. 31)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues. [Business Market Report]
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data are from Thailand, a non-OECD country.
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Medium	The report is more than 10 years old but no more than 20 years old.
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by addressing multiple years but uncertainty is not addressed. Provides estimates from 2008-2014
Overall Quality Determination		Low	

Study Citation:	BMI, (2010). Thailand petrochemicals report Q2 2010. :1-64.		
HERO ID:	5451603		
Conditions of Use:	Manufacturing		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	785,000 tpa ethylene dichloride production in 2008 through 2014 in Thailand (p. 41)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues. [Business Market Report]
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data are from Thailand, a non-OECD country.
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old. 2008-2014
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by addressing multiple years but uncertainty is not addressed. Provides estimates from 2008-2014
Overall Quality Determination		Medium	

Study Citation:	BMI, (2012). Belgium petrochemicals report 2012.		
HERO ID:	5451626		
Conditions of Use:	Manufacture		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	1,935,000 tpa ethylene dichloride production in 2008 through 2016 in Belgium (p. 26)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues. [Business Market Report]
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Belgium, an OECD country.
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old. 2008-2016
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by addressing multiple years but uncertainty is not addressed. Provides estimates from 2008-2016
Overall Quality Determination		Medium	

Study Citation:	BMI, (2010). United Kingdom petrochemicals report Q2 2010.		
HERO ID:	5697839		
Conditions of Use:	Manufacturing		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	600,000 (tpa) in the United Kingdom from 2008-2014.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data are not from frequently-used sources and there are no known quality issues. [Business Market Report]
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from UK, an OECD country.
	Metric 3: Applicability	High	Data are for manufacturing, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old. [2006-2014]
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics. [single values for each year]
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent. [Not fully transparent - general description of methods provided in Methodology section]
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by addressing multiple years but uncertainty is not addressed. [provides estimates from 2008-2014]
Overall Quality Determination		Medium	

Study Citation:	BMI, (2011). South Korea petrochemicals report 2011.		
HERO ID:	5698818		
Conditions of Use:	Manufacturing		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	85,000 tpa ethylene dichloride production in 2008 through 2015 in South Korea (p. 37)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues. [Business Market Report]
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Korea, an OECD country.
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old. 2008-2015
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by addressing multiple years but uncertainty is not addressed. Provides estimates from 2008-2015
Overall Quality Determination		Medium	

Study Citation:	BMI, (2010). Iran petrochemicals report Q3 2010.		
HERO ID:	5703873		
Conditions of Use:	Manufacturing		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	360,000 - 1,260,000 (tpa) in Iran from 2008-2014.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data are not from frequently-used sources and there are no known quality issues. [Business Market Report]
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data are from Iran, a non-OECD country.
	Metric 3: Applicability	High	Data are for manufacturing, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old. [2006-2014]
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics. [single values for each year]
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent. [Not fully transparent - general description of methods provided in Methodology section]
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by addressing multiple years but uncertainty is not addressed. [provides estimates from 2008-2014]
Overall Quality Determination		Medium	

Study Citation:	BMI, (2010). Iran petrochemicals report Q4 2010. :1-62.			
HERO ID:	5703889			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter		Data		
Production, import, or use volume:		360,000-1,260,000 tpa ethylene dichloride production in 2008 through 2014 in Iran (p. 45)		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability		Metric 1: Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues. [Business Market Report]
Domain 2: Representativeness		Metric 2: Geographic Scope	Low	Data are from Iran, a non-OECD country.
		Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.
		Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old. 2006-2014
		Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity		Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty		Metric 7: Metadata Completeness	Medium	Variability addressed by addressing multiple years but uncertainty is not addressed. Provides estimates from 2008-2014
Overall Quality Determination			Medium	

Study Citation:	BMI, (2011). India petrochemicals report Q2 2011. :1-70.			
HERO ID:	5704268			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	390,000 (tpa) in India from 2009-2015			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data are not from frequently-used sources and there are no known quality issues. [Business Market Report]
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data are from India, a non-OECD country.
	Metric 3:	Applicability	High	Data are for manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old. [2009-2015]
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics. [single values for each year]
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent. [Not fully transparent - general description of methods provided in Methodology section]
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by addressing multiple years but uncertainty is not addressed. [provides estimates from 2009-2015]
Overall Quality Determination			Medium	

Study Citation:	BMI, (2011). India petrochemicals report Q1 2011.		
HERO ID:	5704271		
Conditions of Use:	Manufacturing		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	390,000 tpa ethylene dichloride production in 2008 through 2014 in India (p. 54)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues. [Business Market Report]
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data are from India, a non-OECD country.
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old. 2008-2014
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by addressing multiple years but uncertainty is not addressed. Provides estimates from 2008-2014
Overall Quality Determination		Medium	

Study Citation:	BMI, (2010). India petrochemicals report Q3 2010.		
HERO ID:	5704282		
Conditions of Use:	Manufacturing		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	390,000 tpa ethylene dichloride production in 2007 through 2013 in India (p. 53)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues. [Business Market Report]
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data are from India, a non-OECD country.
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old. 2007-2013
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by addressing multiple years but uncertainty is not addressed. Provides estimates from 2007-2013
Overall Quality Determination		Medium	

Study Citation:	BMI, (2010). Indonesia petrochemicals report Q3 2010.		
HERO ID:	5704339		
Conditions of Use:	Manufacturing		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	585,000 tpa ethylene dichloride production in 2008 through 2014 in Indonesia (p. 41)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues. [Business Market Report]
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data are from Indonesia, a non-OECD country.
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old. 2008-2014
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by addressing multiple years but uncertainty is not addressed. Provides estimates from 2008-2014
Overall Quality Determination		Medium	

Study Citation:	BMI, (2010). Indonesia petrochemicals report Q2 2010.		
HERO ID:	5704344		
Conditions of Use:	Manufacturing		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	585,000 tpa ethylene dichloride production in 2008 through 2014 in Indonesia (p. 43)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues. [Business Market Report]
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data are from Indonesia, a non-OECD country.
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old. 2008-2014
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by addressing multiple years but uncertainty is not addressed. Provides estimates from 2008-2014
Overall Quality Determination		Medium	

Study Citation:	BMI, (2013). Hungary petrochemicals report Q3 2013. :1-69.		
HERO ID:	5704793		
Conditions of Use:	Manufacture		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	Two EDC units with capacities of 160,000 (tpa) and 220,000 (tpa).		
Number of sites:	1, BorsodChem		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data are not from frequently-used sources and there are no known quality issues. [Business Market Report]
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Hungary, an OECD country.
	Metric 3: Applicability	High	Data are for manufacturing, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old. [Report published 2013 - unclear when production data were applicable]
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics. [single values for each year]
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent. [Not fully transparent - general description of methods provided in Methodology section]
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium	

Study Citation:	BMI, (2014). Belgium petrochemicals report 2014.		
HERO ID:	5708989		
Conditions of Use:	Manufacturing		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	1,935,000 tpa ethylene dichloride production in 2011 through 2018 in Belgium (p. 14)		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues. [Business Market Report]
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Belgium, an OECD country.
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old. 2011-2018
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by addressing multiple years but uncertainty is not addressed. Provides estimates from 2011-2018
Overall Quality Determination		Medium	

Study Citation:	BMI, (2011). Iran petrochemicals report Q1 2011. :1-61.		
HERO ID:	5741683		
Conditions of Use:	Manufacturing		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	360,000-1,260,000 tpa; years 2008-2015		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data are not from frequently-used sources and there are no known quality issues. [Business Market Report]
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data are from Iran, a non-OECD country.
	Metric 3: Applicability	High	Data are for manufacturing, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old. [2007-2015]
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics. [single values for each year]
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent. [Not fully transparent - general description of methods provided in Methodology section]
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by addressing multiple years but uncertainty is not addressed. [provides estimates from 2007-2015]
Overall Quality Determination		Medium	

Study Citation:	BMI, (2012). Germany petrochemicals report Q1 2012. BMI’s Industry Survey & Forecasts Series :1-50.			
HERO ID:	5741929			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	2,840,000 tpa ethylene dichloride production in 2008 through 2016 in Germany (p. 32)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues. [Business Market Report]
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Germany, an OECD country.
	Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old. 2008-2016
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by addressing multiple years but uncertainty is not addressed. Provides estimates from 2008-2016
Overall Quality Determination		Medium		

Study Citation:	BMI, (2011). Germany petrochemicals report Q2 2011.		
HERO ID:	5870253		
Conditions of Use:	Manufacture		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	2,840,000 tpa capacity for years 2008-2015		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data are not from frequently-used sources and there are no known quality issues. [Business Market Report]
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Germany, an OECD country.
	Metric 3: Applicability	High	Data are for manufacturing, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old. [2007-2015]
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics. [single values for each year]
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent. [Not fully transparent - general description of methods provided in Methodology section]
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by addressing multiple years but uncertainty is not addressed. [provides estimates from 2007-2015]
Overall Quality Determination		Medium	

Study Citation:	Bowler, R. M., Gysens, S., Hartney, C. (2003). Neuropsychological effects of ethylene dichloride exposure. NeuroToxicology 24(4-5):553-562.		
HERO ID:	200241		
Conditions of Use:	Manufacture/processing/use - Clean up workers		
Parameter		EXTRACTION	
Production, import, or use volume:		35,530 (million lbs) (1998) (Pg. 553)	
Domain		EVALUATION	
Metric		Rating	Comments
Domain 1: Reliability			
Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness			
Metric 2:	Geographic Scope	High	Data are from the U.S.
Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
Metric 4:	Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Medium	Variability addressed by sampling in multiple workplaces but uncertainty is not addressed.
Overall Quality Determination		Medium	

Study Citation:	Canada, Health (2013). Guidelines for Canadian drinking water quality: Guideline technical document - 1,2-dichloroethane.			
HERO ID:	7681894			
Conditions of Use:	All conditions of use			
EXTRACTION				
Parameter	Data			
Life cycle description:	The predominant use of 1,2-DCA is as an intermediate for the synthesis of vinyl chloride monomer. It is also used in the manufacture of ethylene oxide, trichloroethane, trichloroethylene and perchloroethylene (OEHHA, 1999; Environment Canada, 2006). 1,2-DCA is also used as an analytical solvent in laboratories and in soaps and scouring compounds, wetting and penetrating agents, organic chemical synthesis, ore flotation, solvents, fumigants, pharmaceuticals, adhesives and glycol production (Lewis, 2001; Environment Canada, 2006).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Canada, an OECD country.
	Metric 3:	Applicability	High	Data are for processing as a reactant, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	N/A	N/A - life cycle description.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The report provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination			High	

Study Citation:	Carbide,, Union (1992). Supplemental information: mortality due to pancreatic and lymphopoietic cancers in chlorohydrin production workers (final report) with cover letter dated 040692.		
HERO ID:	5447107		
Conditions of Use:	Manufacture		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	1.8 (million lbs.) (1946) (Pg. 6)		
Process description:	It produced ethylene chlorohydrin (ECH) from 1925 to 1957,by reacting ethylene with hypochlorous acid. The main by-products formed in this reaction were ethylene dichloride (EDC) and bis-chloroethyl ether(BCEE).		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality methods that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States.
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Low	

Study Citation:	Carroll, W. F., Berger, T. C., Borrelli, F. E., Garrity, P. J., Jacobs, R. A., Ledvina, J., Lewis, J. W., Mccreedy, R. L., Smith, T. P., Tuhovak, D. R., Weston, A. F. (2001). Characterization of emissions of dioxins and furans from ethylene dichloride, vinyl chloride monomer and polyvinyl chloride facilities in the United States. Consolidated report. Chemosphere 43(4-7):689-700.			
HERO ID:	4696729			
Conditions of Use:	Domestic manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	11,115,000 (tonnes) (1995) (pg 3)			
Process description:	Flowsheet on pg 3			
Number of sites:	15 (1995) (pg 3)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination		Low		

Study Citation:	Carroll, W. F., Berger, T. C., Borrelli, F. E., Garrity, P. J., Jacobs, R. A., Lewis, J. W., McCreedy, R. L., Tuhovak, D. R., Weston, A. F. (1998). Characterization of emissions of dioxins and furans from ethylene dichloride (EDC), vinyl chloride (VCM) and polyvinylchloride (PVC) manufacturing facilities in the United States. I. Resin, treated wastewater, and ethylene dichloride. Chemosphere 37(9-12):1957-1972.			
HERO ID:	1938802			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	780,000 (metric tons)			
Process description:	Typically, direct chlorination of ethylene is carried out in a liquid-phase reactor. In the liquid phase reactor, the reactants (ethylene and chlorine) are bubbled up through liquid EDC. Operating temperatures normally range from 50°C (120°F) to 70°C (160°F) and pressures range from approximately 400 to 500 kilopascals (kPa) (4 to 5 atmospheres). Metallic chlorides, such as iron, aluminum, copper, and antimony chlorides, are typically used as catalysts for this process. (Pg. 4)			
Number of sites:	5 sampled; 15 total in US			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	Chauvel, A., Delmon, B., Hölderich, W. F. (1994). New catalytic processes developed in Europe during the 1980s. Applied Catalysis A: General 115(2):173-217.			
HERO ID:	5640288			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Process description: 1,2-DCA is produced via oxychlorination of ethylene, HCL, and air using a selective catalyst which allows for a higher HCl/ethylene ratio.				
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from European countries including France, Germany, and Belgium, which are OECD countries.	
	Metric 3: Applicability	High	Data are for manufacturing, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	N/A	N/A - process description	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A - process description	
Overall Quality Determination		Medium		

Study Citation:	Class, T., Ballschmiter, K. (1987). Global baseline pollution studies: X. Atmospheric halocarbons: Global budget estimations for tetrachloroethene, 1,2-dichloroethane, 1,1,1,2-tetrachloroethane, hexachloroethane and hexachlorobutadiene. Estimation of the hydroxyl radical concentrations in the troposphere of the northern and southern hemisphere. Fresenius' Journal of Analytical Chemistry 327(2):198-204.			
HERO ID:	1441652			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter		Data		
Production, import, or use volume:		12,000 (ktons) (Pg. 5)		
Life cycle description:		70 ktons were used as an anti-knocking agent in gasoline-1980		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability		Metric 1: Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness		Metric 2: Geographic Scope	Medium	Data are for global production.
		Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.
		Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
		Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity		Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty		Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Low	

Study Citation:	Cowfer, J. A., Gorenssek, M. B. (2006). Vinyl chloride. :1-31.
HERO ID:	6301240
Conditions of Use:	Processing as a reactant: Intermediate in Plastic material manufacture

EXTRACTION	
Parameter	Data
Process description:	Commercial processes were developed to produce vinyl chloride from ethylene and chlorine. These processes included direct chlorination of ethylene to form 1,2-dichloroethane (EDC), followed by pyrolysis of EDC to make vinyl chloride. However, because the EDC cracking process also produced HCl as a co-product, the industry did not expand immediately, except in conjunction with acetylene-based technology. The development of ethyleneoxychlorination technology encouraged new growth in the vinyl chloride industry. In this process, ethylene reacts with HCl and oxygen to form EDC. Combining the component processes of direct chlorination, EDC pyrolysis, and oxychlorination provided the so-called balanced process for the production of vinyl chloride from ethylene and chlorine, with no net consumption or production of HCl. Continuation on page 6 of 31
Number of sites:	12

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is from US
	Metric 3:	Applicability	High	The report is for an occupational scenario (vinyl chloride production) within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	2006 - more than 10 but less than 20 years
	Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	Qualitative data provided

Overall Quality Determination

High

Study Citation:	Crowl, D. A. (1995). Introduction. Environmental Science and Pollution Control Series 15:1-19.			
HERO ID:	664303			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	15.94 (billion lbs) (1992) (Pg. 5)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	Dow Chemical, (2026). Dow Chemical Company comments on 1,2-dichloroethane regarding inhalation monitoring data.			
HERO ID:	13245903			
Conditions of Use:	Processing as a reactant			
EXTRACTION				
Parameter	Data			
Life cycle description:	EDC is imported on site from a manufacturer in 2,500lbs totes, utilized in the ethylene oxide production process as a catalyst moderator and then exits the process via purge streams which are treated on site or remain part of a recycle stream which feeds back into the process.			
Process description:	EDC arrives as a liquid in 2,500lb totes at 99% pure grade and is loaded into tanks in a batch process for use in a continuous ethylene oxide production process as a catalyst moderator. Reactors operate at high temperatures (reactor exit temperature of >250 degree C). EDC which isn't consumed in the reaction would either exit the process via purge streams which are treated on site or remain part of a recycle stream which feeds back into the process.			
Throughput:	Annual use rate estimate is roughly 14,000 lbs.			
Number of sites:	EDC is used as a catalyst moderator in the ethylene oxide manufacturing process at two locations (Louisiana = St Charles Operations and Texas = Seadrift).			
Chemical concentration:	EDC arrives at the site as 99% pure.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for processing as a reactant, which is an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Low	Sample distribution (throughput and chemical concentration) is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		High		

Study Citation:	Dow Chemical, (1988). Mortality among Dow Chemical employees of a Texas operations per-tet manufacturing plant with cover letter dated 050389.			
HERO ID:	1441931			
Conditions of Use:	Processing as an intermediate			
EXTRACTION				
Parameter	Data			
Process description:	The Per-Tet production plant was built in 1944. It produces carbon tetrachloride (CC4), percllloroethylene (PCE) and hydrochloric acid. Feedstocks for the Per-Tet thermochlorination reaction, excluding chlorine, consist of by-product streams from other chlorinated hydrocarbon production units in Texas Operations (Table 1). While process changes have been few, the sources of feedstock have differed. The major feedstock has been propylene dichloride (PDC). Crude PDC was piped to a PDC Finishing Unit where heavy and light contaminants were removed by distillation. The finished PDC was then fed to the Per-Tet process;’ (p. 7) 1,2 Ethylene dichloride mentioned on p. 17 as a feedstock.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for processing as an intermediate, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	N/A - no sample data
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - no quantitative data
Overall Quality Determination		Medium		

Study Citation:	Dreher, E. L., Beutel, K. K., Myers, J. D., Lübbe, T., Krieger, S., Pottenger, L. H. (2014). Chloroethanes and chloroethylenes. :1-81.			
HERO ID:	4293766			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Process description:	Basic feedstocks for the production of chlorinated ethanes and ethylenes are ethane or ethylene and chlorine. HCl can be used as a chlorine source when oxychlorination or acetylene hydrochlorination are employed (Fig. 2). The availability of ethane and propane from natural gas and ethylene from naphtha feedstocks has shifted the production of chlorinated C2 hydrocarbons in the Western World from the old carbide–acetylene–vinyl chloride route toward the ethylene route since World War II. The use of ethanol derived from biomass as a starting material has become of interest to reduce the carbon dioxide footprint. Ethanol can be produced from syngas derived from coal gasification with subsequent catalytical dehydration of ethanol to ethylene... Because chlorine is usually needed as a second feedstock, most plants producing chlorinated hydrocarbons are connected to a chloralkali electrolysis unit. The chlorine value of the hydrogen chloride produced as a byproduct in most chlorination processes can be recovered by oxychlorination techniques, hydrochlorination reactions (for synthesis of methyl and ethyl chloride) or, less economically, by aqueous HCl electrolysis. A minor but highly valuable outlet is ultrapure-grade anhydrous HCl used for etching in the electronic industry. (pg 3-4)... Carried out by using chlorine (direct chlorination, DC) or hydrogen chloride (oxy-chlorination) as a chlorinating agent. In practice, both processes are carried out together and in parallel because most EDC plants are connected to vinyl chloride (VCM) units and the oxychlorination process is used to balance the hydrogen chloride from VCM production (see Section 2.1.3.2 and Fig. 14). Depending on the EDC : VCM production ratio of the integrated plants, additional surplus hydrogen chloride from other processes can be fed to the oxychlorination stage for proper balancing and chlorine recovery. (pg 10; detailed PDs start here and go on until pg 17)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S. and other OECD countries.	
	Metric 3: Applicability	High	Data are for MFG, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	N/A	Process Description info	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	Process Description info	
Overall Quality Determination		High		

Study Citation:	Earthjustice, (2019). Ethylene dichloride (EDC): Technical report on the conditions of use.
HERO ID:	11182960
Conditions of Use:	Manufacture

EXTRACTION

Parameter	Data
Production, import, or use volume:	"According to EPA data, the national aggregate production volume of EDC was between 20 and 30 billion pounds per year from 2012 to 2015. The agency provided a precise figure for 2011, when it reported the volume to be 28,109,768,185 lbs. EPA defines aggregate production as domestic manufacturing plus imports. The country's EDC production capacity has been level in recent years. In 2003, according to the NTP, the U.S. had the capacity to produce over 35 billion pounds of EDC. ⁵ This matches the current capacity estimates." [PDF Pg. 3 of 23] Estimated capacity of 15 manufacturers (lbs): Occidental (Gregory, TX): 5,400,000,000 Olin (Freeport, TX): 4,650,000,000 Occidental (LaPorte, TX): 3,900,000,000 Shintech (Plaquemine, LA): 2,900,000,000 Olin (Plaquemine, LA): 2,800,000,000 Westlake (Plaquemine, LA): 2,600,000,000 Formosa (Point Comfort, TX): 2,500,000,000 Westlake (Calvert City, KY): 2,450,000,000 Occidental (Deer park, TX): 2,100,000,000 Westlake (Lake Charles, LA): 1,550,000,000 Occidental (Convent, LA): 1,500,000,000 Westlake (Geismar, LA): 1,400,000,000 Formosa (Baton Rouge, LA): 1,300,000,000 Occidental (Geismar, LA): 600,000,000 Lanxess (Charleston, SC): unknown [PDF Pg. 4 of 23]
Life cycle description:	"Most of the EDC produced is feedstock for PVC production, on-site and in other locations discussed above. Some, however, is sold on the open market and processed for other products... A 2015 American Chemistry Council (ACC) letter to EPA names three ways in which EDC enters into commerce. ACC claimed that 99% is "consumed" in the production of VCM/PVC and, "the remainder is consumed in the production of chlorinated solvents and ethyleneamines." The chemical industry association added, "Other uses of EDC noted in the literature as an ingredient in products such as gasoline (for lead scavenging), paint solvents, coatings, adhesives and grain fumigants have been discontinued, according to several sources. [Pg 7 of 23]
Process description:	"The reaction of chlorine with ethylene creates 1,2-dichloroethane, which is commonly called ethylene dichloride (EDC). Typically, a small amount of ferric chloride is used to catalyze this reaction. EDC is manufactured either via direct chlorination, or by oxychlorination, which uses hydrogen chloride instead of chlorine." [PDF Pg. 3 of 23]
Number of sites:	15 sites presented in Table 1 [PDF Pg. 4 of 23]. The Gulf Coast Region— with the world's lowest manufacturing costs — is the world's most concentrated area of EDC production [Pg 7 of 23]
Chemical concentration:	(as unintended byproduct) "EDC is also widely distributed into commerce as an impurity in products derived from the entire class of chlorinated aliphatic hydrocarbons (CAHCs). According to an EPA economic analysis of EDC in 2000, CAHCs may be produced at different levels of purity (e.g. reagent or analytic grade, technical, commercial (e.g. solvent grade), and pharmaceutical grades), and usually contain production impurities, consisting of other by-product CAHCs (including isomers), other by-product chemicals, stabilizers, water, and metals. EDC is the most commonly processed CAHC, and it is present as an impurity in VCM, PVC resins, and chlorinated solvents. According to the ACC, EDC is present in VCM at levels of between 0.05 and 10 parts per million (ppm). ³² Additionally, VCM, according to the Vinyl Institute, may be present in some PVC resins (suspension resins) at concentrations of 2,000 ppm. ³³ This means EDC may be present in suspension PVC resins at a proportion of 5 parts per billion (0.0000005%). These resins are widely used in residential and commercial building and construction, especially pipes and siding. Suspension PVC resins are also used in food packaging and medical devices such as blood bags. "Methylene chloride, a widely distributed solvent, "may contain up to 1.0% methyl chloride, chloroform, 1,1- dichloroethane, and 1,2-dichloroethene [EDC] as impurities," according to EPA. Chloroform, perchlorethylene, and trichloroethylene are also common chlorinated solvents on the market. EDC has been identified as an impurity in brominated polystyrene (470 parts per million). Albemarle and Lanxess (formerly Great Lakes Chemical) are the two largest brominated flame retardant producers in the U.S., and release EDC into the air at their chemical factories in Arkansas. Albemarle and Lanxess sell brominated polystyrene flame retardants. [Pg 7 and 8 of 23]

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.

Continued on next page ...

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Study Citation:		Earthjustice, (2019). Ethylene dichloride (EDC): Technical report on the conditions of use.		
HERO ID:		11182960		
Conditions of Use:		Manufacture		
Domain		Metric	EVALUATION	
			Rating	Comments
	Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Medium	Variability addressed by giving production volumes for multiple facilities but uncertainty is not addressed.
Overall Quality Determination			High	

Study Citation:	Earthjustice, (2019). Ethylene dichloride (EDC): Technical report on the conditions of use.			
HERO ID:	11182960			
Conditions of Use:	Import			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	A small proportion of EDC is imported; according to the ITC, only 275,000 pounds of EDC were shipped to the U.S. between January 2012 and July 2019 [PDF Pg. 5 of 23]			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by giving production volumes for multiple facilities but uncertainty is not addressed.	
Overall Quality Determination		High		

Study Citation:	Earthjustice, (2019). Ethylene dichloride (EDC): Technical report on the conditions of use.			
HERO ID:	11182960			
Conditions of Use:	Processing as a Reactant			
EXTRACTION				
Parameter	Data			
Life cycle description:	"Lanxess' chemical plant (Charleston, SC) manufactures EDC for processing in its specialty chemical operations. The primary products are phosphorus chloride and its derivatives. Lanxess purchased this plant from Solvay in 2018. Solvay, in its 2012 CDR submission, reported manufacturing EDC in Charleston. [PDF Pg. 5 of 23]Toxic release data identifies additional processors of EDC and ways in which the chemical is used. The largest-scale operations are listed and described on pages 6 and 7 and include manufacturing of ethyleneamines, fluorocarbons used as blowing agents, and UV stabilizers [PDF Pg. 6-7]			
Process description:	"In most cases, EDC manufacturers process this chemical in the course of manufacturing vinyl chloride monomer (VCM) and subsequently, polyvinyl chloride (PVC) resin, in the same location or elsewhere. Some EDC is processed to make other products." [PDF Pg. 5 of 23]			
Number of sites:	"In addition to the PVC manufacturing plants named above [see page 4 of 23, looks like 7 on-site PVC manufacturing named], three other corporations filed CDR forms reporting they process EDC in their facilities. " [PDF Pg. 5 of 23]			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by giving production volumes for multiple facilities but uncertainty is not addressed.	
Overall Quality Determination		High		

Study Citation:	Earthjustice, (2019). Ethylene dichloride (EDC): Technical report on the conditions of use.			
HERO ID:	11182960			
Conditions of Use:	Fuels and Related Products			
EXTRACTION				
Parameter	Data			
Life cycle description:	”In 2016, Ethyl reported to EPA importing undisclosed amounts of EDC for use as fuel additives in the petroleum sector. Since the 1920s, EDC has been used as a lead scavenger, along with ethylene dibromide (EDB) and tetraethyl lead, in antiknock formulations for automobiles. In the 1960s, an estimated 15% of all EDC was used in leaded gas additives. NewMarket/Ethyl Corporation continues to be, “a leading U.S. supplier of tetraethyl lead for aviation and racing fuel,” according to the corporation. EDB is used only in leaded racing fuels, not aviation fuels.... The Pasadena plant has manufactured tetraethyl lead based additives since 1952.” [Pg 5 of 23]”Toxics releases and other data point to the continued distribution of EDC as a component of leaded gasoline additives and other products.” [Pg 7 of 23]			
Chemical concentration:	”A typical automobile leaded gasoline mix has 62% tetraethyl lead, 18% EDC and 18% EDB, and 2% additives such as dyes.” [Pg 5 of 23]			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by giving production volumes for multiple facilities but uncertainty is not addressed.	
Overall Quality Determination		High		

Study Citation:	Earthjustice, (2019). Ethylene dichloride (EDC): Technical report on the conditions of use.			
HERO ID:	11182960			
Conditions of Use:	Laboratory Chemical			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	”Tedia, a solvent distributor, reported exporting 21,783 pounds of EDC in 2016. The company’s sales page for EDC states that it, “is meant for laboratory use.”” [Pg 5 of 23]			
Life cycle description:	”In its 2016 CDR submission, Tedia stated EDC is used, ”as a functional fluid in a closed system in the pharmaceutical and medicine manufacturing sector (and) as a laboratory chemical in the wholesale and retail trade sector.” [Pg 5-6 of 23]			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by giving production volumes for multiple facilities but uncertainty is not addressed.
Overall Quality Determination			High	

Study Citation:	EC, (1984). Ethylene dichloride. Environmental and technical information for problem spills :i - 112.			
HERO ID:	5436082			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	548 (kilotonnes/year) (1982) (Pg. 24)			
Life cycle description:	production of vinyl chloride monomer, in anti-knock compounds in gasoline, and in the processing of adhesives and coatings.			
Process description:	Catalytic chlorination is commonly done by mixing ethylene and chlorine in liquid ethylene dichloride. Where operated in conjunction with a hydrogen chloride source such as a vinyl chloride process, it is also made by oxychlorination of ethylene over a catalyst, in the vapour phase. The ethylene dichloride product is washed, neutralized, and purified by fractionation. (Pg. 25)			
Number of sites:	3			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Canada, an OECD country.	
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination		Medium		

Study Citation:	EC, (1984). Ethylene dichloride. Environmental and technical information for problem spills :i - 112.			
HERO ID:	5436082			
Conditions of Use:	Distribution			
EXTRACTION				
Parameter	Data			
Process description:	”Ethylene dichloride is most commonly shipped in Class 111A60W1 railway tank cars with capacities of 75,700 L, 78,000 L, and 90,900L. It is also shipped in tank motor vehicles and drums(aluminum drums not recommended). Source provides additional clarification on containers. Tank cars are either unloaded by top off-loading or bottom off-loading (bottom off-loading is almost never practiced). Includes compatibility with materials of construction.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Canada, an OECD country.
	Metric 3:	Applicability	High	Data are for transport containers which is applicable for in-scope occupational scenarios.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The report addresses variability in transport containers, but only limited discussion on uncertainty.
Overall Quality Determination		Medium		

Study Citation:	ERG, (1998). Air emissions inventories, volume 2: Point sources: Chapter 11: Preferred and alternative methods for estimating air emissions from plastic products manufacturing.			
HERO ID:	7349020			
Conditions of Use:	Plastic material and resin manufacturing			
EXTRACTION				
Parameter	Data			
Process description:	Plastic products manufacturing involves molding, forming, shaping, or otherwise altering plastic resins or plastic materials to produce an intermediate or final product. This manufacturing industry is also commonly referred to as plastics processing or polymer processing. The manufacture of resins is not a part of plastic products manufacturing; however, some facilities manufacture resins at the same site as where the resins are processed.1 This chapter will not address the manufacture of resins because it is not an activity inherent to plastic products manufacturing. Solid and foamed plastic products are manufactured using plastic resins or solid plastic chips as the starting material. Most plastic products are manufactured by mixing plastic resins with additives, applying heat or pressure to the mixture, and shaping the mixture to form the desired product. A more in-depth process description is given on PDF Pg. 11.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Medium	Data are for processing as a reactant, an in-scope occupational scenario. No mention of 1,2-DCA specifically.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5:	Sample Size	N/A	N/A - process description.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - process description.
Overall Quality Determination			High	

Study Citation:	FDA, (1981). The sampling quantification of emissions from various laboratory sources and the determinations of ambient level concentrations with attached report and cover letter dated 081882.			
HERO ID:	4214079			
Conditions of Use:	Laboratory			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	15,875 mL (Pg. 58)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for laboratory use, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	Fishbein, L. (1979). Potential halogenated industrial carcinogenic and mutagenic chemicals. III. Alkane halides, alkanols and ethers. Science of the Total Environment 11(3):223-257.			
HERO ID:	18092			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Produced: 7.92 billion (lb/yr) in 1976; Import: 75 million (lb/yr) in 1974; Export: 130 million (lb/year) in 1975			
Throughput:	Total U.S. capacity in 1975: 13.8 billion (lb/yr)			
Number of sites:	In 1975, there were 11 ethylene dichloride producing companies in the U.S.A.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Production data are for manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by data being given from multiple years but uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	Fishbein, L. (1976). Industrial mutagens and potential mutagens I. Halogenated aliphatic derivatives. Mutation Research 32(3-4):267-307.		
HERO ID:	5554559		
Conditions of Use:	Manufacture		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	13.8*10^9 (lbs/yr) capacity for U.S. in1975 (Pg. 14)		
Number of sites:	11 sites producing 1,2-dichloroethane for U.S. in 1975		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	The assessment or report uses high quality data and/or techniques or sound methods that are not from a frequently used source and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	More than 20 years old.
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment or report provides results, but the underlying methods and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Low	

Study Citation:	Galan, O., Gomes, V. G., Romagnoli, J., Ngian, K. F. (2009). Selective oxidation of ethylene in an industrial packed-bed reactor: Modelling, analysis and optimization. International Journal of Chemical Reactor Engineering 7(1):A32-A32.			
HERO ID:	5433750			
Conditions of Use:	Oxidation/Reducing Agent			
EXTRACTION				
Parameter	Data			
Process description:	Description of an experimental use of DCE as a low concentration (PPM) additive to reactors performing selective oxidation of ethylene to enhance selectivity. It does not appear that this process exists beyond model or bench scale. (pg. 2/3)			
Comments:	Unclear if model is applicable to current use.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Australia, an OECD country.	
	Metric 3: Applicability	High	Data are for use as a oxidation/reducing agent, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Report is based on industry conditions that are not expected to be completely in use.	
	Metric 5: Sample Size	N/A	no sampling, process description	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination		Medium		

Study Citation:	Hansen, J., Schneider, T., Olsen, J. H., Laursen, B. (1993). Availability of data on humans potentially exposed to suspected carcinogens in the Danish working environment. Pharmacology & Toxicology 72(Supplement 1):77-85.			
HERO ID:	1010267			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter		Data		
Production, import, or use volume:		100 tpy 1,2-Dichloroethane imported and manufactured in Denmark during the 1980s (p. 4)		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Low	Assessment does not specify the methods used.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Denmark, an OECD country.
	Metric 3:	Applicability	High	Data are for MFG, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated (1980s)
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics - single average for the 1980s
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by presenting an average value but uncertainty is not addressed. Study indicates that the value is the "Approximate average amount imported and manufactured a year in Denmark during the 1980s."
Overall Quality Determination			Low	

Study Citation:	Huntsman, (2007). Ethyleneamines: A global profile of products and services.			
HERO ID:	11182964			
Conditions of Use:	Processing as a reactant			
EXTRACTION				
Parameter	Data			
Process description:	”Huntsman manufactures ethyleneamines by the ethylene dichloride/ammonia process. This process consists of the reaction of ethylene dichloride with ammonia, followed by neutralization with sodium hydroxide to produce a mixture of ethyleneamines and sodium chloride. The salt is removed from the amine mixture, and the individual amines are separated by fractional distillation. While most individual distillation fractions are sold as products, others are formulated to obtain desired physical or chemical properties or reacted further to obtain the final product.” [PDF Pg. 9 of 76]			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data/techniques/methods that are not from frequently-used sources and there are no known quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are for the U.S.	
	Metric 3: Applicability	High	Data are for processing as a reactant, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	N/A	N/A- Process description.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A- Process description.	
Overall Quality Determination		High		

Study Citation:	IARC, (1999). Re-evaluation of some organic chemicals, hydrazine, and hydrogen peroxide.			
HERO ID:	201838			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Production in the United States has been reported as follows (thousand tonnes): 1983, 5200; 1990, 6300; 1991, 6200; 1992, 6900; 1993, 8100 (United States National Library of Medicine, 1997) pg. 508			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for manufacturing, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (mean) but discrete samples not provided and distribution not fully characterized.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Reference is provided but other details are lacking	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by production volumes from multiple years but uncertainty is not addressed.	
Overall Quality Determination		Medium		

Study Citation:	IARC, (1999). Re-evaluation of some organic chemicals, hydrazine, and hydrogen peroxide.			
HERO ID:	201838			
Conditions of Use:	Processing as a reactant (intermediate); incorporated into formulation			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	1,2-Dichloroethane is used primarily in the production of vinyl chloride; 99% of total demand in Canada, 90% in Japan and 88% of total production in the United States are used for this purpose.			
Comments:	It is also used in the production of tri- and tetrachloroethylene, vinylidene chloride, ethyleneamines and trichloroethane; as a lead scavenger in antiknock fluids in gasoline; in paint, varnish and finish removers; as a component of metal-degreasing formulations; in soaps and scouring compounds, wetting and penetrating agents, organic synthesis and ore flotation; and as a solvent and fumigant pg 509			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for processing as an intermediate and incorporation into formulation, in-scope occupational scenarios.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old (1999) and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	PV not quantified, just specifying the % of PV for specific use
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	IPCS, (1995). 1,2-Dichloroethane (Second edition).			
HERO ID:	5175349			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	5,038,000 (tonnes) (1980) (Pg. 12); 6,318,000 (tonnes) (1991)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by multiple years of data but uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	Jacobs, E. S. (1980). Use and Air Quality Impact of Ethylene Dichloride and Ethylene Dibromide Scavengers in Leaded Gasoline. Banbury Report, vol. 5 :239-255.			
HERO ID:	2743177			
Conditions of Use:	Fuels and related products			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	U.S. consumption of EDC as a lead scavenger was as follows (in metric tons): 1970 - 103,000; 1971 - 98,000; 1972 - 101,000; 1973 - 98,000; 1974 - 84,000; 1975 - 79,000; 1976 - 82,000; 1977 - 77,000; 1978 - 72,000; 1979 - 60,000; 1980 - 37,000; 1985 - 23,000.			
Chemical concentration:	DuPont antiknock motor fuel contains 18.81% EDC.			
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for fuels and related products, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by data from multiple years.
Overall Quality Determination			High	

Study Citation:	Kleijn, R., Voet, V.D., E., Haes, U.d., H. A. (1994). Controlling substance flows: The case of chlorine. Environmental Management 18(4):523-542.			
HERO ID:	1718788			
Conditions of Use:	Domestic Manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	550,000 (tonnes) (Pg. 12)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from the Netherlands, an OECD country.
	Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and inustry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Low	

Study Citation:	KVB Inc, (1980). An inventory of carcinogenic substances released into the ambient air of California: Final report - Task II and Task IV.			
HERO ID:	5443893			
Conditions of Use:	Solvents			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	250 tpy (only in CA, two sites) pg. 31			
Number of sites:	<10 in CA (pg. 31)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for solvents, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	N/A (annual capacity and number of sites data)
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	KVB Inc, (1980). An inventory of carcinogenic substances released into the ambient air of California: Final report - Task II and Task IV.			
HERO ID:	5443893			
Conditions of Use:	Fuels and related products			
EXTRACTION				
Parameter	Data			
Chemical concentration:	1:0.294:0.304 ratio of tetraethyl lead (TEL), EBD, and 12-DCA in antiknock solutions added to gasoline (pg 116)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for fuels and related products, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	N/A (concentration data)
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	Lashmanova, N. V., Kolesnikov, V. A., Efremov, R. V., Danov, S. M. (1990). Effect of feedstock quality on concentration of 1,3-butadiene in vinyl-chloride obtained in the pyrolysis of 1,2-dichloroethane. Journal of Applied Chemistry of the USSR 63(8):1761-1763.			
HERO ID:	5451716			
Conditions of Use:	Processing - Production of Vinyl Chloride			
EXTRACTION				
Parameter	Data			
Process description:	The basic industrial method of production VC is thermal dehydrogenation (pyrolysis) of 1,2-dichloroethane (DCE). In the pyrolysis of DCE the concentration of impurities in the VC, including 1,3-butadiene, is affected by a number of factors. It can be proposed that the composition of the DCE being fed to the pyrolysis reactor has the greatest effect.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	The assessment or report uses high quality data and/or techniques or sound methods that are not from a frequently used source and associated information does not indicate flaws or quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	The report is from a non-OECD country.	
	Metric 3: Applicability	High	Data is for processing, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	N/A	N/A - process description.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A - process description.	
Overall Quality Determination		Medium		

Study Citation:	Levy, L. S., Lee, W. R. (1994). Aliphatic chemicals. :139-190.			
HERO ID:	664424			
Conditions of Use:	Processing/Use			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	In the United States 80 per cent of the 1,2-dichloroethane produced is used as a starting material for vinyl chloride and other structurally related chlorinated chemicals, as a constituent of anti-knock compounds, as a grain and seed fumigant and as a commonly used solvent. PDF pg 13			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Low	Report does not specify the source(s) for this data.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for processing, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	N/A	%PV data	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination		Low		

Study Citation:	Love, O. T., Jr, Miltner, R. J., Eilers, R. G., Fronk-Leist, C. A. (1983). Treatment of volatile organic compounds in drinking water.			
HERO ID:	5255836			
Conditions of Use:	Processing as a reactant			
EXTRACTION				
Parameter	Data			
Process description:	Tetrachloroethylene is commercially produced by chlorinating acetylene (CH :: CH) or 1,2-dichloroethane (CH2 C1CH2 Cl), also known as ethylene dichloride.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5:	Sample Size	N/A	N/A - Process Description
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - Process Description
Overall Quality Determination		High		

Study Citation:	Marshall, K. A., Pottenger, L. H. (2016). Chlorocarbons and chlorohydrocarbons. :1-29.
HERO ID:	3828879
Conditions of Use:	Manufacturing

EXTRACTION	
Parameter	Data
Production, import, or use volume:	World capacity of EDC in 2009 was 57,381,000 my and in 2014 it was 64,191,000 mt.
Process description:	A typical commercial process for the preparation of 1,2-dichloroethane is the chlorination of ethylene at moderate temperatures (78). The direct chlorination process is normally conducted as a liquid-phase reaction, and usually the product EDC is the reaction medium. The addition of chlorine to the ethylene double bond is facilitated through the use of a Lewis acid catalyst such as ferric chloride. The direct chlorination process is characterized by very high yields. The primary byproducts are the products of over-chlorination of EDC, in particular 1,1,2- trichloroethane. The formation of by-products can be suppressed in a number of ways. Introduction of a small amount of air to the process is one method used to suppress undesired free-radical reactions. Use of co-catalysts has also been reported to be effective. Mixing of the ethylene and chlorine has also been identified as an important factor in maintaining good yield of EDC. The use of multiple reactors has also been employed to optimize yield.

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old. 2016.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination

Medium

Study Citation:	Marshall, K. A., Pottenger, L. H. (2016). Chlorocarbons and chlorohydrocarbons. :1-29.			
HERO ID:	3828879			
Conditions of Use:	Processing as a reactant			
EXTRACTION				
Parameter	Data			
Process description:	PDF Pg. 11 contains a diagram of the manufacturing process of chlorinated hydrocarbons, which includes 1,2-DCA. In most regions of the world, vinyl chloride is produced almost exclusively by thermal dehydrochlorination of EDC, which in turn is produced from ethylene. Two processes are typically used to produce the feedstock EDC from ethylene. EDC may be produced by the direct chlorine addition to ethylene. It is also produced by the oxychlorination of ethylene with oxygen and HCl. The exception to the production of vinyl chloride from ethylene-derived EDC is in China, where significant capacity has been installed for the production of vinyl chloride via the hydrochlorination of coal-derived acetylene. Vinyl chloride is produced from EDC by a thermal dehydrochlorination process. Reactions are conducted in cracking furnaces, somewhat similar to the process for hydrocarbon cracking. The gas-phase thermal dehydrochlorination of 1,2-dichloroethane at 350–515 C proceeds by a radical-chain mechanism. The reaction is accelerated by radical initiators such as chlorine and retarded or inhibited by olefins and alcohols. A typical cracking furnace for the production of vinyl chloride has a residence time of 3–10 s. Per pass conversion of EDC ranges from 40 to 60%. Typical by-products include acetylene and dimerization products of vinyl chloride and acetylene. Overall process yields range from 98 to 99%.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for processing as a reactant, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old. 2016.	
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination		Medium		

Study Citation:	Mcmamus, K. P. (1992). Health Hazard Evaluation Report HETA 91-251-2218, New Hampshire Ball Bearing, Laconia, New Hampshire. 4(HETA-91-251-2218):91-251.
HERO ID:	2780125
Conditions of Use:	Adhesives and sealants

EXTRACTION

Parameter	Data
Process description:	Cloth preparation room, Teflon fabric pieces, measuring 18 x 24 inches, are roll coated with adhesive and allowed to cure in a drying room. Curing times vary from 7-14 days. One side of the fabric is roll coated with adhesive and allowed to cure before the other side is coated and allowed to cure. Sometimes a third coat is required to meet certain specifications. The adhesives used contain various resins, including phenol-formaldehyde, methylene dianiline, and styrenebutadiene. Several solvents are also used in the cloth room, as carriers for the adhesive and to clean the roll coating machine. Ethanol, dichloroethane, trichloroethane and freon-113 were identified. Oven Room, prior to entering the Teflon Room for assembly, bushings are prepared in the Oven Room. Usually one employee works in this room. Bushings are sprayed with a lubricant and put in ovens for drying. Two types of lubricant are used: Vydax and Freekote. Vydax is a tetrafluoroethylene telomer suspended in freon-113. Freekote is a similar material suspended in trichloroethylene. Both materials leave a lubricating film on the bushing after the solvent is driven off. Teflon Room, cut strips of teflon cloth, already impregnated with adhesive, are glued to the inside diameter of the bushings.
Number of sites:	1

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	NIOSH Study
Domain 2: Representativeness	Metric 2: Geographic Scope	High	US
	Metric 3: Applicability	High	The report is for an occupational scenario (coating process) within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	More than 20 years old
	Metric 5: Sample Size	N/A	Process description. Qualitative information provided.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Information provided was derived from NIOSH site visit.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The report provides only limited discussion of the variability and uncertainty in the results.

Overall Quality Determination**High**

Study Citation:	Nagel, C. J., Chanenchuk, C. A., Wong, E. W., Bach, R. D. (1996). Catalytic extraction processing: An elemental recycling technology. Environmental Science & Technology 30(7):2155-2167.			
HERO ID:	660326			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Process description:	FIGURE 7. Schematic diagram for CEP recycling application in isocyanate manufacturing. (Pg. 11)			
Comments:	15,000 hours/year of operations			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for Disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	hours of operation/yr
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	(2000). RCRA listing background document: trichloroethylene and perchloroethylene production. 1978. 7847019:#40-7847019.			
HERO ID:	2799557			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Hex Waste: 88 (MT) (Pg. 11)			
Process description:	Perchloroethylene and trichloroethylene are produced by a single stage oxychlorination process from ethylene dichloride and chlorine. Ethylene dichloride, chlorine, oxygen and recycled chlorinated organics are fed to a fluid bed reactor. An oxychlorination catalyst is used under pressure and 425 C. (Pg. 6)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	(1965). 1,2-dichloroethane. (Ethylene chloride, ethylene dichloride, glycol dichloride). American Industrial Hygiene Association Journal 26(4):435-438.			
HERO ID:	5443990			
Conditions of Use:	Industrial Uses			
EXTRACTION				
Parameter	Data			
Life cycle description:	1,2-Dichloroethane is utilized in the separation of wax from petroleum, for oil extraction, in the production of photographic films and in paint removers. It is also used as a lacquer thinner, dry-cleaning agent, fumigant and chemical intermediate.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Low	The data, data sources, and/or techniques or methods used in the assessment or report are not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	N/A - no samples.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Low		

Study Citation:	NCBI, (2020). PubChem Annotation Record for 1,2-Dichloroethane.			
HERO ID:	9641339			
Conditions of Use:	All			
EXTRACTION				
Parameter		Data		
Production, import, or use volume:		Demand: (1999) 15.089 billion lbs; (2000) 15.632 billion lbs; (2004) 17.938 billion lbs (68/79). U.S. imports (1999) 340 million lbs; (2000) 329 million lbs (page 69/79).		
Process description:		1,2-Dichloroethane is industrially produced by chlorination of ethylene. This reaction can either be carried out by using chlorine(direct chlorination, DC) or hydrogen chloride (oxychlorination) as a chlorinating agent (page 67/79)		
Number of sites:		According to the 2016 TSCA Inventory Update Reporting data, 17 reporting facilities (page 37/79)		
Chemical concentration:		1,2-Dichloroethane was detected in 5 of 1043 household products (divided into eight categories) tested. Positive results were (% frequency, % w/w average concentration); automotive products (0.6, 0.1), oils, greases and lubricants (2.6, 0.1) and miscellaneous products (3.2, <0.1)(page 37/79).		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability		Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources (CDR, published literature, Kirk-Othmer) and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness		Metric 2: Geographic Scope	High	Data are from the U.S.
		Metric 3: Applicability	High	Data are for all COUs in scope.
		Metric 4: Temporal Representativeness	Medium	Data age varies from 1980-2018.
		Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics (average, frequency).
Domain 3: Accessibility/ Clarity		Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty		Metric 7: Metadata Completeness	Medium	Variability is addressed by citing multiple studies. Uncertainty isn’t addressed.
Overall Quality Determination			High	

Study Citation:	NICNAS, (2013). Ethane, 1,2-dichloro-: Human health tier II assessment.			
HERO ID:	5155545			
Conditions of Use:	Paints and lacquers, adhesives, fertilizers			
EXTRACTION				
Parameter	Data			
Chemical concentration:	The product types are paints and lacquers (concentrations between 1 and 100%), adhesives (concentrations between 10 and 50%) and fertilizers (concentrations below 1%). (Pg. 3)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Australia, an OECD country.
	Metric 3:	Applicability	High	Data are for paints and coatings, adhesives and sealants, in-scope occupational scenarios.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by testing multiple products, uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	NIOSH, (1976). Criteria for a recommended standard: Occupational exposure to ethylene dichloride (1,2-dichloroethane).			
HERO ID:	412734			
Conditions of Use:	Domestic manufacture			
EXTRACTION				
Parameter	Data			
Process description:	Manufacturing processes are based on the chlorination of ethylene. The reaction between ethylene and and chlorine yields a mixture of 1, 2-dichloroethane, 1,1-dichloroethane, and 1,1,2- trichloroethane. by controlling the temperature of the reaction and by using specific catalysts, the production of additional products such as ethylene dichloride can be enhanced. 1, 2-dichloroethane is also produced by hydrochlorination of ethylene and is obtained as a by-product of trichloroethylene synthesis.			
Number of sites:	15			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Older NIOSH study
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US
	Metric 3:	Applicability	High	The report is for an occupational scenario (domestic manufacture) within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	1976 - more than 20 years old
	Metric 5:	Sample Size	N/A	Qualitative information provided - Process description
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	N/A	Qualitative information provided
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	Qualitative information provided
Overall Quality Determination		Medium		

Study Citation:	NIOSH, (1981). Permeation of protective garment materials by liquid halogenated ethanes and a polychlorinated biphenyl.			
HERO ID:	5476924			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	1978 production was 10.5 (billion lbs)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	NIOSH, (1978). Current intelligence bulletin 27 Chloroethanes: review of toxicity.			
HERO ID:	64409			
Conditions of Use:	Health effects study - condition of use not specified			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	8 billion pounds (1976)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Estimate of 1976 production. NIOSH report.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US
	Metric 3:	Applicability	Medium	Total production - specific occupational scenarios not provided
	Metric 4:	Temporal Representativeness	Low	1978 - more than 20 years old
	Metric 5:	Sample Size	Low	Single production value
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Low	

Study Citation:	NIOSH, (1978). Current intelligence bulletin 25: Ethylene dichloride (1,2-dichloroethane).			
HERO ID:	7310531			
Conditions of Use:	General article that reports results from a NIOSH survey, numerous exposures occurred in the following industries: chemical and allied products, printing and publishing, electrical equipment and supplies, wholesale and retail trade, food and kindred products, leather and leather products, and machinery.			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Between 1973 and 1976, the United States annual average production of ethylene dichloride was approximately 10 billionpounds.			
Number of sites:	4775			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	NIOSH Study
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US
	Metric 3:	Applicability	Medium	Seems appropriate for a wide range of industries.- data on specific industries is not provided.
	Metric 4:	Temporal Representativeness	Low	The report is more than 20 years old. April 19,1978.
	Metric 5:	Sample Size	N/A	Process and facility data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	NIOSH study with references
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The report provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination		Medium		

Study Citation:	NTP, (1991). Toxicity studies of 1,2-dichloroethane (ethylene bichloride) (CAS No. 107-06-2) in F344/N rats, Sprague Dawley rats, Osborne-Mendel rats, and B6C3F1 mice (drinking water and gavage studies).			
HERO ID:	1772371			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	13 (billion lbs.) (Pg. 9)			
Process description:	produced commercially either by vapor or liquid phase reaction of chlorine with ethylene or metal chloride			
Chemical concentration:	40 to 800 mg/m3			
Comments:	Page 9-11			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	Nunez, C., McMinn, B., Vitas, J. (1996). Barriers to the use of radiation-curable adhesives in the coated and laminated substrate manufacturing industry. Journal of Hazardous Materials 45(1):59-78.			
HERO ID:	5466433			
Conditions of Use:	Adhesives and sealants			
EXTRACTION				
Parameter		Data		
Process description:		Section 3.3 on PDF Pg. 5.		
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for adhesives and sealants, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	N/A - process description
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - process description
Overall Quality Determination			Medium	

Study Citation:	OECD, (2000). Report of the OECD workshop on improving the use of monitoring data in the exposure assessment of industrial chemicals.			
HERO ID:	7310550			
Conditions of Use:	Fuels and related products			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	”The main use of 1,2-dichloroethane (EDC) - currently accounting for more than 95% of production - is to make vinyl chloride monomer (VCM) on which PVC is based. The remaining EDC production (under 5%) is used in three areas: as a raw material for manufacture of ethyleneamines, trichloroethylene and perchloroethylene; as an extraction and cleaning solvent; and as a lead scavenger for petrol.” [PDF Pg. 91]			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from the OECD.
	Metric 3:	Applicability	High	Data are for Fuels and related products, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	OECD, (2000). Report of the OECD workshop on improving the use of monitoring data in the exposure assessment of industrial chemicals.			
HERO ID:	7310550			
Conditions of Use:	Processing as a reactant			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	”The main use of 1,2-dichloroethane (EDC) - currently accounting for more than 95% of production - is to make vinyl chloride monomer (VCM) on which PVC is based. The remaining EDC production (under 5%) is used in three areas: as a raw material for manufacture of ethyleneamines, trichloroethylene and perchloroethylene; as an extraction and cleaning solvent; and as a lead scavenger for petrol.” [PDF Pg. 91]			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from the OECD.
	Metric 3:	Applicability	High	Data are for processing as a reactant, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	OECD, (2000). Report of the OECD workshop on improving the use of monitoring data in the exposure assessment of industrial chemicals.			
HERO ID:	7310550			
Conditions of Use:	Solvents (for cleaning and degreasing)			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	”The main use of 1,2-dichloroethane (EDC) - currently accounting for more than 95% of production - is to make vinyl chloride monomer (VCM) on which PVC is based. The remaining EDC production (under 5%) is used in three areas: as a raw material for manufacture of ethyleneamines, trichloroethylene and perchloroethylene; as an extraction and cleaning solvent; and as a lead scavenger for petrol.” [PDF Pg. 91]			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from the OECD.
	Metric 3:	Applicability	High	Data are for solvents (for cleaning and degreasing), an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	Peters, R. W., Daniels, E. J., Wolsky, A. M. (1992). RESEARCH AGENDA FOR WASTE MINIMIZATION. Water Science and Technology INTERNATIONAL ASSOCIATION ON WATER POLLUTION RESEARCH AND CONTROL(INTERNATIONAL ASSOCIATION ON WATER POLLUTION RESEARCH AND CONTROL);17-20.			
HERO ID:	1621894			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	6.83 *10^6 (tons) (Pg. 4)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Low		

Study Citation:	Qin-li, Zhang, Qiao, Niu, Lai-yu, Li, Li-jun, Yang, Xiao-li, Guo, Jian-xun, Huang, Lin-ping, Wang, You-xin, Liang (2010). Toxic encephalopathy induced by occupational exposure to 1,2-dichloroethane and toxicological effect on animal model. :89-93.			
HERO ID:	4492125			
Conditions of Use:	Adhesives and Sealants			
EXTRACTION				
Parameter	Data			
Chemical concentration:	92-97% DCE in glues			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Low	The techniques or methods used to determine concentration in the assessment or report are not specified.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	The data are from a non-OECD country (China).	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	High	The report is generally no more than 10 years old.	
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.	
Overall Quality Determination		Low		

Study Citation:	Randel, S. (1989). Nine plants enter an environmental world. Chemical Business 11(9):27-29.			
HERO ID:	5441866			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Occidental Chemical Corp. Corpus Christi Plant: 80 million lbs/yr in 1989.			
Number of sites:	Discusses one, newly built manufacturing site.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	N/A (annual capacity and number of sites data)
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	Reed, D. J. (2000). Chlorocarbons and chlorohydrocarbons, survey.			
HERO ID:	7310689			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	The U.S. demand for 1,2-dichloroethane was 7,146,000 tons in 1987 and 8,468,000 tons in 1992.			
Process description:	1,2-Dichloroethane, an important intermediate for vinyl chloride production, is produced by catalytic chlorination of ethylene in either vapor or liquid phase or by oxychlorination of ethylene. Thermal dehydrochlorination of 1,2-dichloroethane produces vinyl chloride and coproduct hydrogen chloride. Hydrogen chloride is commonly recycled to an oxychlorination unit to produce 1,2-dichloroethane or is processed into sales-grade anhydrous or aqueous hydrogen chloride.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple years of demand volumes.
Overall Quality Determination			Medium	

Study Citation:	RIVM, (2007). Ecotoxicologically based environmental risk limits for several volatile aliphatic hydrocarbons. :217.			
HERO ID:	5159900			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	The order of several millions of tonnes in the 1980-1990s (Pg. 51)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is described qualitatively.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

Study Citation:	Rosenfeld, P. E., Feng, H., L.G. (2011). The petroleum industry. :57-71.			
HERO ID:	6108171			
Conditions of Use:	Processing aid: petroleum production			
EXTRACTION				
Parameter	Data			
Number of sites: 40,000 oil and gas fields of varying sizes throughout world, 94% of which concentrated in fewer than 1,500 giant and major fields (pg 6-7)				
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources (EPA, other agencies and industry).
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Low	Data are for processing aids: petroleum production, an in-scope occupational scenario; however, release sources/estimates are not specific to any chlorinated solvent (just mentions chlorinated solvents as a type of waste)
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics (single estimates provided).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by considering varying geographies and waste/treatment types, but uncertainty is not addressed.
Overall Quality Determination			Medium	

Study Citation:	Smith, R. L. (2002). Evaluating the economics and environmental friendliness of conceptual designs for new and retrofitted chemical processes. Clean Technologies and Environmental Policy 3(4):383-391.			
HERO ID:	5442869			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Process description:	Pyrolysis of 1,2-DCA to form vinyl chloride which includes a pyrolysis reactor achieving a conversion of 0.8 followed by two distillation columns to separate other compounds from VC and 1,2-DCA and to recycle 1,2-DCA. (Pg. 6)			
Throughput:	~7,900,000 kmol/year (Pg.6)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality methods that are not from frequently-used sources and there are no known quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Low	Sample distribution is described qualitatively.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by discussing conversion assumptions but uncertainty is not addressed.	
Overall Quality Determination		Medium		

Study Citation:	Snedecor, G., Hickman, J. C., Mertens, J. A. (2004). Chloroethylenes.
HERO ID:	3827414
Conditions of Use:	Manufacture

EXTRACTION	
Parameter	Data
Production, import, or use volume:	Table 2 provides producers and their capacities. pg. 4/26
Life cycle description:	"A significant portion of ethylene chloride (EDC) is converted to vinyl chloride monomer which is used in the production of poly(vinyl chloride)."pg. 4/26"Production of vinyl chloride monomer comprises 94% of EDC use. Three percent goes to the production of ethylene amines; 1% goes to the production of 1,1,1-trichloroethane; 1% goes to the production of vinylidene chloride; 1% goes to miscellaneous uses (includes production of trichloroethylene and perchloroethylene) (29)."pg. 5/26
Process description:	"1,2-Dichloroethane is produced by the vapor- (15) or liquid-phase chlorination of ethylene. Most liquid-phase processes use small amounts of ferric chloride as the catalyst. Other catalysts claimed in the patent literature include aluminum chloride, antimony pentachloride, and cupric chloride and an ammonium, alkali, or alkaline-earth tetrachloroferrate (16). The chlorination is carried out at 40–508C with 5% air or other free-radical inhibitors (17) added to prevent substitution chlorination of the product. Selectivities under these conditions are nearly stoichiometric to the desired product. The exothermic heat of reaction vaporizes the 1,2-dichloroethane product, which is purified by distillation. Oxychlorination of ethylene has become the second important process for 1,2- dichloroethane. The process is usually incorporated into an integrated vinyl chloride plant in which hydrogen chloride, recovered from the dehydrochlorination or cracking of 1,2-dichloroethane to vinyl chloride, is recycled to an oxychlorination unit. The hydrogen chloride by-product is used as the chlorine source in the chlorination of ethylene in the presence of oxygen and copper chloride catalyst. Reactor designs have included fixed and fluidized beds. A fluidized-bed oxychlorination reactor developed by B. F. Goodrich is claimed to provide very good temperature control (18). A large number of patents deal with the catalyst technology (19–27), which usually includes CuCl ₂ and minor amounts of byproduct inhibitors, such as potassium, sodium, lithium, or magnesium. To reduce oxidation to carbon dioxide and carbon monoxide, plant designs may include two or three reactors in series, with the HCl and oxygen feeds split to the secondary reactor(s) to decrease the C ₂ H ₄ :oxygen ratio in each reactor. By-products of this reaction include carbon dioxide, carbon monoxide, ethyl chloride, 1,1,2-trichloroethane, and trichloroacetaldehyde (chloral). The reactor products are usually condensed, unreacted HCl and water are separated from the organics, and the 1,2-dichloroethane is purified by distillation. Unreacted ethylene and oxygen can be recycled to the reactor, or sent to a vent recovery system; however, a purge is needed in the recycle system to prevent inert gas buildup in the recycle stream. Air or pure oxygen can be used; oxygen-based systems lose less ethylene during the inert purge."pg. 3-4/26
Number of sites:	Table 2 shows 17 plants (Dow, Freeport TX, 2 plants) pg. 4/26

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	The assessment or report uses high quality data and/or techniques or sound methods that are not from a frequently used source and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Data cited in report is mostly over 20 years old
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity				

Continued on next page ...

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Study Citation:	Snedecor, G., Hickman, J. C., Mertens, J. A. (2004). Chloroethylenes.
HERO ID:	3827414
Conditions of Use:	Manufacture

Domain		Metric	EVALUATION	
			Rating	Comments
	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Medium	The report provides only limited discussion of the variability and uncertainty in the results.

Overall Quality Determination**Medium**

Study Citation:	Stangroom, S. J., Collins, C. D., Lester, J. N. (1998). Sources of organic micropollutants to lowland rivers. Environmental Technology 19(7):643-666.			
HERO ID:	659430			
Conditions of Use:	Manufacturing			
		EXTRACTION		
Parameter	Data			
Production, import, or use volume:		7,601,961 (tons) (Pg. 6)		
		EVALUATION		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from the United Kingdom, an OECD country.
	Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (mean) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Low	

Study Citation:	Troisi, F., Cavallazzi, D. (1961). Fatal poisoning from inhalation of dichloroethane vapors. La Medicina del Lavoro 52:612-618.			
HERO ID:	17899			
Conditions of Use:	Processing as a reactant			
EXTRACTION				
Parameter	Data			
Process description:	Mixing of 1,2-DCA (1,000L), acetylketogluconic acid (1000kg), and methyl alcohol (100L) in a reaction boiler. Heated to 60 C for 30 hours then cooled to 15 C and transferred to centrifuges.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	The report uses sound sources that are not from a frequently used source	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Italy, an OECD country.	
	Metric 3: Applicability	High	Data are for processing, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are clear but data sources were unclear.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	Process description is specific to site where fatal incident occurred. Variability/uncertainty in this type of data is N/A.	
Overall Quality Determination		Low		

Study Citation:	U.S. EPA, (n.d.). AP-42: Chapter 3 - Stationary Internal Combustion Sources.			
HERO ID:	10180484			
Conditions of Use:	Various Solvent Uses			
EXTRACTION				
Parameter	Data			
Process description:	[AP-42 Section 3.1] "Carbon monoxide oxidation catalysts are typically used on turbines to achieve control of CO emissions, especially turbines that use steam injection, which can increase the concentrations of CO and unburned hydrocarbons in the exhaust. CO catalysts are also being used to reduce VOC and organic HAPs emissions. The catalyst is usually made of a precious metal such as platinum, palladium, or rhodium. Other formulations, such as metal oxides for emission streams containing chlorinated compounds, are also used." [740289, page 7 of 20, see page for more context][AP-42 Section 3.2]3 design classes: 2-cycle (stroke) lean-burn, 4-stroke lean-burn, and 4-stroke rich-burn (described in more detail PDF pg 2).			
Comments:	Note that this extraction is for 3.1 and 3.2 of the AP-42 document (along with each section’s associated emission factor documentation). 3.3 and 3.4, also extracted in this file, do not appear to have 1,2-DCA information			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources (AP-42).	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for an in-scope occupational scenario and specific to 1,2-DCA	
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.	
	Metric 5: Sample Size	N/A	Not applicable - Process description/physical form.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by discussing different engine types but uncertainty is not addressed.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2020). 2020 CDR: Commercial and consumer use.			
HERO ID:	10366189			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	National aggregated Production volume was noted to be between 30 and 40 billion lbs for 2019 (cell AU)			
Throughput:	2019 production volumes are provided for 7 facilities. other 11 facilities claim CBI (cell AQ)Shintech 6,131,870,601Formosa Plastics 927,456,774Formosa Plastics 3,589,162,392Ethyl Corp 0Westlake chemical 2,354,112,000Buckman Labs 53,035Lanxess Corp 25,357,858			
Number of sites:	filtering for 1,2-dichloroethane there are 18 facilities based on EPA facility ID (cell V for site names)			
Chemical concentration:	Maximum concentration greater than 90% for all sites that report (cell BG)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	EPA 2020 CDR
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	USA
	Metric 3:	Applicability	High	Plastics manufacturing
	Metric 4:	Temporal Representativeness	High	data represents 2019
	Metric 5:	Sample Size	High	individual records are provided to allow for the development of appropriate statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	EPA 2020 CDR
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	detailed data are provided that can be used to assess variability and uncertainty.
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2022). DMR Data for TCEP, formaldehyde, trans-1,2-dichloroethylene, 1,1-dichloroethane, and 1,2-dichloroethane.			
HERO ID:	11181053			
Conditions of Use:	All			
EXTRACTION				
Parameter	Data			
Number of sites:	The dataset provides the number of sites with NPDES permits that are required to report to DMR.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Data is from DMR, a frequently used EPA source.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	DMR data are from the U.S.	
	Metric 3: Applicability	High	Data are for all in-scope COUs.	
	Metric 4: Temporal Representativeness	High	Data are less than 10 years old.	
	Metric 5: Sample Size	N/A	Number of sites not based on sampling data.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Submissions do not include method of how number of sites were determined or reported. There may be sites that release the chemical of interest, but do not report to DMR.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability is addressed by including number of site data from multiple reporting years. Uncertainty isn't addressed.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2022). Chemical repackaging - Generic scenario for estimating occupational exposures and environmental releases (revised draft).			
HERO ID:	11182966			
Conditions of Use:	Repackaging			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Table B-1 presents PMN data on repackaging rate in kg chemical/site-yr. (pg 84 of 116)			
Process description:	Pre-manufacture notices (PMN) submitted from 2010 to 2020 under EPA’s New Chemicals Program indicated imported and repackaged chemicals can be solids or liquids and may be neat or in solutions/mixtures and contained in various packaging types. After they arrive at the repackaging site, repackaging operations occur where the chemical is transferred from the transport container it was imported in to a new one of a different size in order to meet the customer’s needs (JACO, 2021). Chemicals may also be transferred from original containers to intermediate storage containers before packaging into smaller containers (Cooke, 2013; NIOSH, 2009). Chemicals are expected to be received at repackaging sites in drums or larger bulk containers (supersacks, totes, tank trucks, etc.) (Cooke, 2013; NIOSH, 2009). The chemical of interest may be received in its final formulation and transferred directly from these large containers into smaller containers, charged to a temporary storage tank, or it may be charged to a mixing tank and diluted or mixed with other chemicals before it is repackaged. Once the chemical has been formulated to desired specifications, it can be repackaged. Workers may be potentially exposed during the unloading of chemicals from the original transport containers into temporary storage or new transport containers. Releases of chemicals may also occur during this stage, from open container surfaces (e.g., if the chemical is volatile), transfer operations (e.g., if the chemical is volatile or a powder), and original transport container disposal. Repackaging operations for liquid chemicals typically involve pouring or pumping the product from the original containers or mixing /storage tanks into the new containers. A study conducted by the Health and Safety Laboratory in the U.K. investigated two chemical repackaging sites (Cooke, 2013). At both of these sites the chemical was delivered to the site by road tanker and pumped into dedicated storage tanks. One of the sites, a hydrazine supplier, pumped the hydrazine into a mixing vessel where it was diluted with water and packaged into smaller containers for sale to customers. At the other site, trichloroethylene was pumped from storage tanks into a closed loop system where workers using a hydraulic lance connected to a semi-automated filling system transferred the chemical into new containers (Cooke, 2013). The usual process for repackaging solid chemicals differs from the processes for liquids. A NIOSH Health Hazard Evaluation Report (HHE) from 2009 investigated a repackaging facility that was transferring bulk shipments of silane-coated glass beads ranging between 0.2 – 1.2mm in diameter. At this facility, 2,200 lb supersacks of the product are lifted with a forklift over a metal bin, then cutting the bottom of the container with a knife to empty the beads into the bin. The metal bin is then lifted by a forklift, and the glass beads are poured into hoppers. From the hoppers the beads are gravity fed into smaller cardboard boxes or paper sacks that are shipped to customers (NIOSH, 2009). Workers may be potentially exposed during the transfer of chemicals from temporary storage into new transport containers. Releases of chemicals may also occur during this stage from open container surfaces (e.g., if the chemical is volatile), transfer operations (e.g., if the chemical is volatile or a powder), and cleaning any equipment that was used in during the process.(Page 12-3 of 116, see page 12 for a figure of process/release and exposure points)			
Number of sites:	Table 1-2 presents the number of repackaging sites for four NAICS codes based on 2019 U.S. Census data. (page 11 of 116)			
Chemical concentration:	A fraction of completed IRERs from 2010-2020 were reviewed, 21 submissions contained information on chemical repackaging. In these submissions, chemicals were repackaged at concentrations ranging from 1% to 100%, with a 50th percentile of 93%, a 95th percentile of 100%, and a mode of 100% (page 16 of 116)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality information/data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data
	Metric 3:	Applicability	Medium	Data are for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
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Study Citation:		U.S. EPA, (2022). Chemical repackaging - Generic scenario for estimating occupational exposures and environmental releases (revised draft).		
HERO ID:		11182966		
Conditions of Use:		Repackaging		
Domain		Metric	EVALUATION	
			Rating	Comments
Metric 5:		Sample Size	High	Statistical distribution of samples is fully characterized (discrete use amounts provided).
Domain 3: Accessibility/ Clarity				
Metric 6:		Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty				
Metric 7:		Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple repackaging facilities.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (1982). Development document for effluent limitations, guidelines and standards for the pulp, paper, and paperboard, and the builders paper and board mills (final report) (EPA 440/1-82/025).			
HERO ID:	1316234			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Process description:	Currently, biological treatment consists of oxidation basins, aeration stabilization basins, and an activated sludge process. (Pg. 357)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	N/A	N/A - no sample data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - no sample data.
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2025). Toxics Release Inventory (TRI): 1,2-Dichloroethane, reporting years 2019-2024.			
HERO ID:	13246591			
Conditions of Use:	All			
EXTRACTION				
Parameter	Data			
Number of sites: The dataset provides the number of manufacturing, processing, or use sites that reported to TRI.				
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for all conditions of use.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and is no more than 10 years old.
	Metric 5:	Sample Size	Low	Sample distribution is described qualitatively.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by data from multiple facilities.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2025). Discharge Monitoring Report (DMR): 1,2-Dichloroethane, reporting years 2019-2024.			
HERO ID:	13246592			
Conditions of Use:	All			
EXTRACTION				
Parameter	Data			
Number of sites: The dataset provides the number of sites with NPDES permits that are required to report to DMR.				
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Data is from DMR, a frequently used EPA source.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	DMR data are from the U.S.	
	Metric 3: Applicability	High	Data are for all in-scope COUs.	
	Metric 4: Temporal Representativeness	High	Data are less than 10 years old.	
	Metric 5: Sample Size	N/A	Number of sites not based on sampling data.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Submissions do not include method of how number of sites were determined or reported. There may be sites that release the chemical of interest, but do not report to DMR.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability is addressed by including number of site data from multiple reporting years. Uncertainty isn't addressed.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2025). National Emissions Inventory (NEI): 1,2-Dichloroethane, reporting years 2017 and 2020.			
HERO ID:	13246593			
Conditions of Use:	All			
EXTRACTION				
Parameter	Data			
Number of sites:	Dataset provides the number of sites that reported to NEI.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Data is from NEI, a frequently used EPA source.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	NEI data are from the U.S.	
	Metric 3: Applicability	High	Data are for all in-scope COUs.	
	Metric 4: Temporal Representativeness	High	Data are less than 10 years old.	
	Metric 5: Sample Size	N/A	Number of sites not based on sampling data.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Universe is limited to facilities with units subject to NESHAP with threshold potential to emit.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability is addressed by including sites from multiple reporting years. Uncertainty isn't addressed.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (1981). Chapter 4.6: Solvent degreasing. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.
HERO ID:	3045012
Conditions of Use:	Degreasing

EXTRACTION	
Parameter	Data
Process description:	In a typical cold cleaner, dirty parts are cleaned manually by spraying and then soaking in the tank. After cleaning, the parts are either suspended over the tank to drain or are placed on an external rack that routes the drained solvent back into the cleaner. (page 1 of 6)A typical vapor degreaser is a sump containing a heater that boils the solvent to generate vapors. The height of these pure vapors is controlled by condenser coils and/or a water jacket encircling the device. Solvent and moisture condensed on the coils are directed to a water separator, where the heavier solvent is drawn off the bottom and is returned to the vapor degreaser. A ""freeboard"" extends above the top of the vapor zone to minimize vapor escape. Parts to be cleaned are immersed in the vapor zone, and condensation continues until they are heated to the vapor temperature. Residual liquid solvent on the parts rapidly evaporates as they are slowly removed from the vapor zone. (page 3 of 6)Additional more specific vapor degreasing process descriptions are included in document

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality information/data from frequently-used sources. From AP-42
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	AP-42 is based on U.S. data.
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5:	Sample Size	N/A	process description, no sample size relevant
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple degreasing methods.

Overall Quality Determination	Medium
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Study Citation:	U.S. EPA, (1980). Chapter 4.7: Waste solvent reclamation. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.			
HERO ID:	3840001			
Conditions of Use:	Treatment/Recycling of Spent Solvents			
EXTRACTION				
Parameter	Data			
Process description:	Handling includes loading waste solvent into process equipment and filling drums and tanks prior to transport and storage through submerged or bottom loading. Waste solvents are initially treated by vapor recovery or mechanical separation. Condensation of solvent vapors is accomplished by water-cooled condensers and refrigeration units. Initial treatment of liquid waste solvents is accomplished by mechanical separation methods. This includes both removing water by decanting and removing undissolved solids by filtering, draining, settling, and/or centrifuging. Mixed solvents are separated by multiple simple distillation methods, such as batch or continuous rectification. After distillation, water is removed from solvent by decanting or salting. (2-4 of 6)			
Chemical concentration:	Adequate recovery, solvent concentration above 20 mg/m3 is required. (page 2 of 6)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality information/data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	AP-42 is based on U.S. data.	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.	
	Metric 5: Sample Size	N/A	process description	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (1995). AP-42: Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition.
HERO ID:	46492
Conditions of Use:	Waste handling, treatment and disposal

EXTRACTION

Parameter	Data
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Process description:

The multiple hearth furnace was originally developed for mineral ore roasting nearly a century ago. The air-cooled variation has been used to incinerate sewage sludge since the 1930s. The basic multiple hearth furnace (MHF) is a vertically oriented cylinder. The outer shell is constructed of steel, lined with refractory, and surrounds a series of horizontal refractory hearths. A hollow cast iron rotating shaft runs through the center of the hearths. Cooling air is introduced into the shaft which extend above the hearths. Each rabble arm is equipped with a number of teeth, approximately 6 inches in length, and spaced about 10 inches apart. The teeth are shaped to rake the sludge in a spiral motion, alternating in direction from the outside in, to the inside out, between hearths. Typically, the upper and lower hearths are fitted with four rabble arms, and the middle hearths are fitted with two. Burners, providing auxiliary heat, are located in the sidewalls of the hearths. In most multiple hearth furnaces, partially dewatered sludge is fed onto the perimeter of the top hearth. The rabble arms move the sludge through the incinerator by raking the sludge toward the center shaft where it drops through holes located at the center of the hearth. In the next hearth the sludge is raked in the opposite direction. This process is repeated in all of the subsequent hearths. The effect of the rabble motion is to break up solid material to allow better surface contact with heat and oxygen. A sludge depth of about 1 inch is maintained in each hearth at the design sludge flow rate. Scum may also be fed to one or more hearths of the incinerator. Scum is the material that floats on wastewater. It is generally composed of vegetable and mineral oils, grease, hair, waxes, fats, and other materials that will float. Scum may be removed from many treatment units including pre-aeration tanks, skimming, and sedimentation tanks. Quantities of scum are generally small compared to those of other wastewater solids. Ambient air is first ducted through the central shaft and its associated rabble arms. A portion, or all, of this air is then taken from the top of the shaft and recirculated into the lowermost hearth as preheated combustion air. Shaft cooling air which is not circulated back into the furnace is ducted into the stack downstream of the air pollution control devices. The combustion air flows upward through the drop holes in the hearths, countercurrent to the flow of the sludge, before being exhausted from the top hearth. Air enters the bottom to cool the ash. Provisions are usually made to inject ambient air directly into the middle hearths as well. From the standpoint of the overall incineration process, multiple hearth furnaces can be divided into three zones. The upper hearths comprise the drying zone where most of the moisture in the sludge is evaporated. The temperature in the drying zone is typically between 425 and 760°C (800 and 1400°F). Sludge combustion occurs in the middle hearths (second zone) as the temperature is increased to about 925°C (1700°F). The combustion zone can be further subdivided into the upper-middle hearths where the volatile gases and solids are burned, and the lower-middle hearths where most of the fixed carbon is combusted. The third zone, made up of the lowermost hearth(s), is the cooling zone. In this zone the ash is cooled as its heat is transferred to the incoming combustion air. Multiple hearth furnaces are sometimes operated with afterburners to further reduce odors and concentrations of unburned hydrocarbons. In afterburning, furnace exhaust gases are ducted to a chamber where they are mixed with supplemental fuel and air and completely combusted. Some incinerators have the flexibility to allow sludge to be fed to a lower hearth, thus allowing the upper hearth(s) to function essentially as an afterburner. Under normal operating condition, 50 to 100 percent excess air must be added to an MHF in order to ensure complete combustion of the sludge. Besides enhancing contact between fuel and oxygen in the furnace, these relatively high rates of excess air are necessary to compensate for normal variations in both the organic characteristics of the sludge feed and the rate at which it enters the incinerator. When an inadequate amount of excess occurs, with a resultant increase in emissions of carbon monoxide, soot, and hydrocarbons. Too much excess air, on the other hand, can cause increased entrainment of particulate and unnecessarily high auxiliary fuel consumption. Multiple hearth furnace emissions are usually controlled by a venturi scrubber, an impingement tray scrubber, or a combination of both. Wet cyclones and dry cyclones are also used. Wet electrostatic precipitators (Wet ESPs) are being installed as retrofits where tighter limits on particulate matter and metals are required by State regulations.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	USEPA - AP42
Domain 2: Representativeness	Metric 2: Geographic Scope	High	US

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Study Citation:	U.S. EPA, (1995). AP-42: Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition.			
HERO ID:	46492			
Conditions of Use:	Waste handling, treatment and disposal			
		EVALUATION		
Domain		Metric	Rating	Comments
	Metric 3:	Applicability	High	The report is for an occupational scenario (sludge incineration) within the scope of the risk evaluation. 1995 - more than 20 year old qualitative information provided
	Metric 4:	Temporal Representativeness	Low	
	Metric 5:	Sample Size	N/A	
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	Low	Underlying methods, data sources, andassumptions are not fully transparent.
Domain 4: Variability and Uncertainty				
	Metric 7:	Metadata Completeness	Low	qualitative information provided
Overall Quality Determination			Medium	

Study Citation:	U.S. EPA, (1995). Chapter 4.2: Introduction to surface coating. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.
HERO ID:	7315820
Conditions of Use:	adhesives and sealants: coating operations

EXTRACTION

Parameter	Data
Process description:	Process description for different types of coating (See sections: 4.2.2.1 for Industrial surface coating, 4.2.2.2 for Can Coating, 4.2.2.3 for Magnetic Wire Coating, 4.2.2.4 for Other Metal Coating, 4.2.2.5 for Flat Wood Interior Panel Coating, 4.2.2.6 for Paper Coating, 4.2.2.7 for Polymeric Coating Of Supporting Substrates, 4.2.2.8 for Automobile And Light Duty Truck Surface Coating Operations, 4.2.2.9 for Pressure Sensitive Tapes And Labels Solvent base surface coating, 4.2.2.10 for Metal Coil Surface Coating, 4.2.2.11 for Large Appliance Surface Coating, 4.2.2.12 for Metal Furniture Surface Coating, 4.2.2.13 for Magnetic Tape Manufacturing, 4.2.2.14 for Surface Coating Of Plastic Parts For Business Machines)

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Recognized EPA Reference (AP-42)
Domain 2: Representativeness	Metric 2: Geographic Scope	High	US
	Metric 3: Applicability	High	The report is for an occupational scenario (surface coating) within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	1995 more than 20 years old
	Metric 5: Sample Size	N/A	Qualitative information
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	The report clearly documents its data sources, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	Qualitative information

Overall Quality Determination**High**

Study Citation:	U.S. EPA, (1995). Ap-42: Chapter 4.12 - Manufacture of rubber products.			
HERO ID:	7315841			
Conditions of Use:	Processing as a reactant			
EXTRACTION				
Parameter	Data			
Process description:	The manufacturing of rubber products involves six principal processing steps (mixing, milling, extrusion, calendering, curing, and grinding), with ancillary steps in between. Initially, the raw rubber (natural or synthetic) is mixed with several additives which are chosen based upon the desired properties of the final product. The mixed rubber is often milled and transferred to an extruder where it can be combined with other rubbers. Many rubber products contain synthetic fabric or fibers for strengthening purposes. These fibers are typically coated with mixed rubber using a calender. The extruded rubber and rubber coated materials are then assembled into a final shape and cured. Among the steps in the tire assembly process, described in more detail below, are bead building; cementing and marking; cutting and cooling; tire building; and green tire spraying. It is during the curing process that the rubber vulcanizes (crosslinks), producing the characteristic properties of finished rubber. Once the final product is cured, it is often ground to remove rough surfaces and/or to achieve symmetry.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for processing as a reactant, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5:	Sample Size	N/A	N/A - process description.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.
HERO ID:	7325487
Conditions of Use:	Other uses

EXTRACTION	
Parameter	Data
Process description:	Ethylene Dichloride as a grain fumigant Fumigants are used during binning (placement in storage) and turning (shifting from one storage facility to another) operations or at any time during storage when infestation occurs. A variety of structures are used for grain storage. Farm grain storage facilities are mostly metal with some wooden bins of flat, older and loose-fitting construction. Country elevators are of two types: small banked concrete silos and flat storages. At mills, banked silos are predominant. Terminal elevators are banked silos. Grain transportation vehicle's include trucks, rail cars (box, freight, hopper), inland barges, ocean barges and ships. Subterminal and terminal elevators and shipholds are usually almost air tight, while farm grain storage facilities generally allow considerable air flow. On-farm facilities typically have a capacity of about 3,000 bushels, while country elevators have a capacity of about 300,000 bushels. Terminal elevators have an average capacity of 4 million bushels. Grain fumigants are applied primarily by the "gravity distribution" method by either surface application or layering. This method is practiced both on-farm and off-farm. A second method of fumigant application is "outside of car" application, where the fumigant is either poured from one or five gallon containers through vents located in the roof of the car or sprayed into the car with a power sprayer. Equipment used to apply fumigants includes common garden sprinkling cans with spray heads removed; 3 to 5 gallon capacity compressed air sprayers from which the nozzles have been removed; high capacity motor driven pumps which apply large volumes of liquid materials directly from large drums; metering devices which treat streams of moving grain; and distribution tube and pressure reduction valve systems for discharging of liquids stored under pressure. The rate of application of fumigants is dependent on the type of grain and the type of storage facility. The application rates for off-farm storage are lower since these types of facilities are typically more tight-fitting than on-farm storage. After application of fumigants, grain generally is left undisturbed for at least 72 hours. The usual practice is to leave the grain for a much longer period. Fumigants are often left on the grain until the normal turning procedure is undertaken. Alternatively, the grain may be aerated by turning after completion of the required treatment period. In tight-fitting facilities equipped with recirculation or forced distribution blowers, the fumigant is ventilated from the grain with fresh air by operating the blowers for 3 to 4 hours.
Chemical concentration:	Ethylene Dichloride as a grain fumigant Ethylene dichloride is used as a component of fumigant mixtures that are applied to control insect infestations in grains during storage, transfer, milling, distribution and processing. Ethylene dichloride comprises 7.1 percent of the total weight of fumigant active ingredients applied to stored grain.

EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	USEPA
Domain 2: Representativeness	Metric 2: Geographic Scope	High	US
	Metric 3: Applicability	High	The report is for an occupational scenario (Ethylene Dichloride as a grain fumigant) within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	1984 - more than 20 years old
	Metric 5: Sample Size	N/A	Qualitative information provided
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	Qualitative information provided

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Study Citation:	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.		
HERO ID:	7325487		
Conditions of Use:	Other uses		
Domain	Metric	EVALUATION Rating	Comments
Overall Quality Determination		High	

Study Citation: U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.	
HERO ID: 7325487	
Conditions of Use: Adhesives and Sealants	
EXTRACTION	
Parameter	Data
Process description:	EDC is used in the manufacture of paints, coatings, and adhesives. EDC is thought to be used as a solvent in paints and coatings which use vinyl polymers, particularly polyvinyl chloride. EDC use in adhesives is restricted to adhesives using acrylics.
EVALUATION	
Domain	Metric
Domain 1: Reliability	Rating
Metric 1:	Methodology
	High USEPA
Domain 2: Representativeness	
Metric 2:	Geographic Scope
Metric 3:	Applicability
	High US
Metric 4:	Temporal Representativeness
Metric 5:	Sample Size
	High The report is for an occupational scenario (EDC is used in the manufacture of paints, coatings, and adhesives) within the scope of the risk evaluation.
	Low 1984 - more than 20 years old
	N/A Qualitative information provided
Domain 3: Accessibility/ Clarity	
Metric 6:	Metadata Completeness
	High Assessment or report clearly documents its data sources
Domain 4: Variability and Uncertainty	
Metric 7:	Metadata Completeness
	N/A Qualitative information provided
Overall Quality Determination	High

Study Citation: U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.	
HERO ID: 7325487	
Conditions of Use: Other use	
EXTRACTION	
Parameter	Data
Process description:	Ethylene dichloride as an extraction solventEDC is used in a number of solvent extraction applications. Major applications include the extraction of oil from seeds, the processing of animal fats, and the processing of pharmaceutical products.
EVALUATION	
Domain	Metric
Domain 1: Reliability	Rating
Metric 1:	Methodology
	High USEPA
Domain 2: Representativeness	
Metric 2:	Geographic Scope
Metric 3:	Applicability
	High US
Metric 4:	Temporal Representativeness
Metric 5:	Sample Size
	High The report is for an occupational scenario (Ethylene dichloride as an extraction solvent) within the scope of the risk evaluation.
	Low 1984 - more than 20 years old
	N/A Qualitative information provided
Domain 3: Accessibility/ Clarity	
Metric 6:	Metadata Completeness
	High Assessment or report clearly documents its data sources
Domain 4: Variability and Uncertainty	
Metric 7:	Metadata Completeness
	N/A Qualitative information provided
Overall Quality Determination	High

Study Citation:	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.			
HERO ID:	7325487			
Conditions of Use:	Domestic manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Production 3,451,488 Megagrams (1982) / Export 277,000 Megagrams (1981)			
Number of sites:	12 manufactures in 19 facilities (1983)			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	USEPA
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US
	Metric 3:	Applicability	High	The report is for an occupational scenario (EDC production) within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	1984 - more than 20 years old
	Metric 5:	Sample Size	N/A	Qualitative information provided
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	Qualitative information provided
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.			
HERO ID:	7325487			
Conditions of Use:	Processing as a reactant: Intermediate in plastic material manufacture			
EXTRACTION				
Parameter	Data			
Process description:	Vinyl Chloride productionEthylene dichloride is introduced into the pyrolysis furnace where it is cracked in the vapor phase at temperatures of 450 to 620°C and pressures of 450 to 930 kPa. About 50 percent conversion of EDC to VCM is achieved in the reaction. The product gas stream from the furnace, containing VCM, EDC, and HCl is quenched with liquid EDC, and fed to a condenser. Hydrogen chloride is removed from the condenser in the gas phase, and is recovered for use on site, generally in EDC production. The liquid stream from the condenser is fed to a distillation column, where it is separated into VCM product, unreacted EDC, and heavy ends. The unreacted EDC is recycled either to the quench column or to the finishing section of an EDC plant. Vinyl chloride product is used either on-site or sold, and heavy ends are incinerated.			
Number of sites:	Manufacture 12 facilities			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	USEPA
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US
	Metric 3:	Applicability	High	The report is for an occupational scenario (vinyl chloride production) within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	1984 - more than 20 years old
	Metric 5:	Sample Size	N/A	Qualitative information provided
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	Qualitative information provided
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.				
HERO ID:	7325487				
Conditions of Use:	Processing as a reactant: Intermediate in all other basic organic chemical manufacture				
EXTRACTION					
Parameter	Data				
Process description:	Methyl chloroform production–Vinyl Chloride Hydrochlorination/1,1-Dichloroethane Chlorination Process–Vinyl chloride, hydrogen chloride (HCl), recycled methyl chloroform, and ferric copper catalyst are combined in a tower-type reactor. In the reactor, a hydrochlorination reaction between vinyl chloride and HCl takes place at temperatures of 35 to 40°C, producing 1,1-dichloroethane. After being cooled in a condenser, the reaction products are fed to a purification column. The dichloroethane fraction is removed as an overhead stream from the column, and fed to a chlorination reactor. There, the dichloroethane is reacted with chlorine gas at atmospheric pressure and about 400°C to produce methyl chloroform and byproduct hydrogen- chloride. The entire product stream from the chlorination reactor, containing methyl chloroform, HCl, and a small amount of unreacted 1,1-dichloroethane, is recycled to the hydrochlorinator reactor. The recycled methyl chloroform is removed in the purification column as a high boiling fraction, and is sent to a stripper column where it is steam-stripped and distilled to yield a purified product. Vinylidene Chloride Hydrochlorination Process– Vinylidene chloride, hydrochloric acid, and small quantity of ferric chloride catalyst are fed to the hydrochlorination reactor. The reaction is conducted in the liquid phase at 25 to 35°C. Crude methyl chloroform product is withdrawn continuously from the hydrochlorination reactor and purified by fractional distillation. The purified product is treated to remove moisture and is combined with appropriate stablizers to make the material suitable for commercial use.				
Number of sites:	3				
EVALUATION					
Domain	Metric	Rating		Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	USEPA	
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US	
	Metric 3:	Applicability	High	The report is for an occupational scenario (methyl chloroform production) within the scope of the risk evaluation.	
	Metric 4:	Temporal Representativeness	Low	1984 - more than 20 years old	
	Metric 5:	Sample Size	N/A	Qualitative information provided	
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources	
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	Qualitative information provided	
Overall Quality Determination			High		

Study Citation:	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.			
HERO ID:	7325487			
Conditions of Use:	Processing as a reactant: Intermediate in all other basic organic chemical manufacture			
EXTRACTION				
Parameter	Data			
Process description:	Ethyleneamines may be produced by reacting EDC with ammonia in either the liquid phase or the vapor phase. The major product of both of these reactions is ethylenediamlne. Byproducts of the reactions include diethylenetriamine, triethylenetetramine, tetraethylenepentamine, pentaethylenhexamine, and higher polymers. In the vapor phase reaction, EDC and an excess of anhydrous ammonia are reacted at 150°C and 9.0 MPa. Anhydrous ethylenediamine hydrochloride is formed, which, on treatment with caustic soda at 100°C, yields free ethylenediamine (NH2CH2CH2NH2). Ethylenediamine vapors, steam, and unreacted ammonia are fed to a dehydrating column where the diamine is dried and condensed. In the liquid phase process, EDC is treated with excess aqueous ammonia at 100°C and 1.0 MPa. The aqueous product solution containing ethylenediamine hydrochloride, ammonium chloride, and ammonia is heated with caustic soda and fractionated. The ethylenediamine is drawn off and the ammonium chloride is recycled to the reaction vessel.			
Number of sites:	2			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	USEPA
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US
	Metric 3:	Applicability	High	The report is for an occupational scenario (Ethylene amine production) within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	1984 - more than 20 years old
	Metric 5:	Sample Size	N/A	Qualitative information provided
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	Qualitative information provided
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.
HERO ID:	7325487
Conditions of Use:	Processing as a reactant: Intermediate in all other basic organic chemical manufacture

EXTRACTION	
Parameter	Data
Process description:	Trichloroethylene production Ethylene Dichloride Chlorination Process—The major products of the EDC chlorination process are TCE, PCE, and hydrogen chloride (HCl). EDC and chlorine vapors are fed to a chlorination reactor. The chlorination is carried out at a high temperature (400 to 450°C), slightly above atmospheric pressure, without the use of a catalyst. Other chlorinated C2 hydrocarbons or recycled chlorinated hydrocarbon byproducts may be fed to the chlorinator. The product stream from the chlorination reaction consists of a mixture of chlorinated hydrocarbons and HCl. Hydrogen chloride is separated from the chlorinated hydrocarbon mixture and used in other processes. The chlorinated hydrocarbon mixture is neutralized with sodium hydroxide solution and is then dried. Spent caustic is transferred to a wastewater treatment plant. The dried crude product is separated by a PCE/TCE column into crude TCE and crude PCE. The crude TCE is fed to a TCE column, where light ends are removed overhead. Bottoms from this column, containing TCE and heavies, are sent to the finishing column, where TCE is removed overhead and sent to TCE storage. Heavy ends are combined with light ends from the TCE column and stored for eventual recycling. The crude PCE from the PCE/TCE column is fed to a PCE column, where PCE goes overhead to PCE storage. Bottoms from this column are fed to a heavy ends column. Overheads from the heavy ends column are recycled and bottoms, consisting of tars, are incinerated. These bottoms, called "hex wastes", may be processed further or heated to recover more volatilizable materials, with the resulting tars sent to disposal, often by incineration. This additional step recovers 80 to 90 percent of the bottoms. Ethylene Dichloride Oxychlorination Process— The major products of the EDC oxychlorination process are TCE, PCE, and water. Side reactions produce carbon dioxide, hydrogen chloride (HCl), and several chlorinated hydrocarbons. Essentially all byproduct organics are recovered during purification and are recycled to the reactor. EDC, chlorine or hydrogen chloride, oxygen and recycled byproducts are fed to a fluid-bed reactor in the gas phase. The reactor contains a vertical bundle of tubes with boiling liquid outside the tubes to maintain the reaction temperature at about 425°C. The reaction takes place at pressures slightly above atmospheric. Copper chloride catalyst is added continuously to the tube bundle. The reactor product is fed to a water-cooled condenser and then a refrigerated condenser. Condensed material and catalyst fines drain to a decanter. In the decanter the crude product is separated from an aqueous phase. The aqueous phase, containing catalyst fines, is sent to a waste treatment plant. Crude product is fed to a drying column where dissolved water is removed by azeotropic distillation. The water from the drying column is sent to the waste treatment plant and the dried crude product is separated into crude TCE and crude PCE in a PCE/TCE column. Crude TCE is sent to a TCE column, where the light ends are removed overhead and stored for recycle. The bottoms are neutralized with ammonia and then dried to produce finished TCE, which is sent to storage. The crude PCE from the PCE/TCE is fed to a heavy ends column where PCE and light ends are removed overhead. Heavy ends, called "hex wastes," are sent to an organic recycle system, where the organics that can be recycled are separated from tars, which are incinerated. The PCE and light ends from the heavies column are fed to a PCE column, where the light ends are removed overhead and sent to the recycle organic storage tank. The PCE bottoms are neutralized with ammonia and then dried to produce finished PCE which is sent to storage.

EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	USEPA
Domain 2: Representativeness	Metric 2: Geographic Scope	High	US
	Metric 3: Applicability	High	The report is for an occupational scenario (Trichloroethylene production) within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	1984 - more than 20 years old
	Metric 5: Sample Size	N/A	Qualitative information provided
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources
Domain 4: Variability and Uncertainty			
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Study Citation:		U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.		
HERO ID:		7325487		
Conditions of Use:		Processing as a reactant: Intermediate in all other basic organic chemical manufacture		
		EVALUATION		
Domain	Metric	Rating	Comments	
	Metric 7: Metadata Completeness	N/A	Qualitative information provided	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.
HERO ID:	7325487
Conditions of Use:	Processing as a reactant: Intermediate in all other basic organic chemical manufacture

EXTRACTION	
Parameter	Data
Process description:	Trichloroethylene production Ethylene Dichloride Chlorination Process—The major products of the EDC chlorination process are TCE, PCE, and hydrogen chloride (HCl). EDC and chlorine vapors are fed to a chlorination reactor. The chlorination is carried out at a high temperature (400 to 450°C), slightly above atmospheric pressure, without the use of a catalyst. Other chlorinated C2 hydrocarbons or recycled chlorinated hydrocarbon byproducts may be fed to the chlorinator. The product stream from the chlorination reaction consists of a mixture of chlorinated hydrocarbons and HCl. Hydrogen chloride is separated from the chlorinated hydrocarbon mixture and used in other processes. The chlorinated hydrocarbon mixture is neutralized with sodium hydroxide solution and is then dried. Spent caustic is transferred to a wastewater treatment plant. The dried crude product is separated by a PCE/TCE column into crude TCE and crude PCE. The crude TCE is fed to a TCE column, where light ends are removed overhead. Bottoms from this column, containing TCE and heavies, are sent to the finishing column, where TCE is removed overhead and sent to TCE storage. Heavy ends are combined with light ends from the TCE column and stored for eventual recycling. The crude PCE from the PCE/TCE column is fed to a PCE column, where PCE goes overhead to PCE storage. Bottoms from this column are fed to a heavy ends column. Overheads from the heavy ends column are recycled and bottoms, consisting of tars, are incinerated. These bottoms, called "hex wastes", may be processed further or heated to recover more volatilizable materials, with the resulting tars sent to disposal, often by incineration. This additional step recovers 80 to 90 percent of the bottoms. Ethylene Dichloride Oxychlorination Process— The major products of the EDC oxychlorination process are TCE, PCE, and water. Side reactions produce carbon dioxide, hydrogen chloride (HCl), and several chlorinated hydrocarbons. Essentially all byproduct organics are recovered during purification and are recycled to the reactor. EDC, chlorine or hydrogen chloride, oxygen and recycled byproducts are fed to a fluid-bed reactor in the gas phase. The reactor contains a vertical bundle of tubes with boiling liquid outside the tubes to maintain the reaction temperature at about 425°C. The reaction takes place at pressures slightly above atmospheric. Copper chloride catalyst is added continuously to the tube bundle. The reactor product is fed to a water-cooled condenser and then a refrigerated condenser. Condensed material and catalyst fines drain to a decanter. In the decanter the crude product is separated from an aqueous phase. The aqueous phase, containing catalyst fines, is sent to a waste treatment plant. Crude product is fed to a drying column where dissolved water is removed by azeotropic distillation. The water from the drying column is sent to the waste treatment plant and the dried crude product is separated into crude TCE and crude PCE in a PCE/TCE column. Crude TCE is sent to a TCE column, where the light ends are removed overhead and stored for recycle. The bottoms are neutralized with ammonia and then dried to produce finished TCE, which is sent to storage. The crude PCE from the PCE/TCE is fed to a heavy ends column where PCE and light ends are removed overhead. Heavy ends, called "hex wastes," are sent to an organic recycle system, where the organics that can be recycled are separated from tars, which are incinerated. The PCE and light ends from the heavies column are fed to a PCE column, where the light ends are removed overhead and sent to the recycle organic storage tank. The PCE bottoms are neutralized with ammonia and then dried to produce finished PCE which is sent to storage.
Number of sites:	7

		EVALUATION	
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	USEPA
Domain 2: Representativeness	Metric 2: Geographic Scope	High	US
	Metric 3: Applicability	High	The report is for an occupational scenario (Perchloroethylene Production) within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	1984 - more than 20 years old
	Metric 5: Sample Size	N/A	Qualitative information provided
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources

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Study Citation:	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.		
HERO ID:	7325487		
Conditions of Use:	Processing as a reactant: Intermediate in all other basic organic chemical manufacture		
		EVALUATION	
Domain	Metric	Rating	Comments
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	N/A	Qualitative information provided
Overall Quality Determination		High	

Study Citation:	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.			
HERO ID:	7325487			
Conditions of Use:	Processing as a reactant: Intermediate in all other basic organic chemical manufacture			
EXTRACTION				
Parameter	Data			
Process description:	Vinylidene chloride productionVinylidene chloride production, or 1,1-dichloroethene, is used primarily in the production of polyvinylidene copolymers such as Saran® and some modacrylic fibers. It is manufactured domestically by a two step process. The first step involves the chlorination or oxychlorination of EDC to produce 1,1,2-trichloroethane. The second step is dehydrochlorination of 1,1,2-trichloroethane to produce vinylidene chloride. Little data are available on the specific steps used in the production of 1,1,2-trichloroethane; however the process used to produce vinylidene chloride from 1,1,2-trichloroethane is described extensively in published literature.Most 1,1,2-trichloroethane is made by chlorination of EDC. The reaction is carried out in the liquid phase at 120°C and 345 kPa. The major products are hydrogen chloride (HCl) and 1,1,2-trichloroethane. Where 1,1,2-trichloroethane is made by oxychlorination the reactants are EDC, HCl, and oxygen. Reaction conditions vary from one process to another. Water and 1,1,2-trichloroethane are the major products of this reaction. After 1,1,2-trichloroethane is produced, it is dehydrochlorinated with aqueous sodium hydroxide at about 70°C. Major products of the reaction are vinylidene chloride, sodium chloride, and water.			
Number of sites:	3			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	USEPA
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US
	Metric 3:	Applicability	High	The report is for an occupational scenario (Vinylidene chloride production) within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	1984 - more than 20 years old
	Metric 5:	Sample Size	N/A	Qualitative information provided
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	Qualitative information provided
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.			
HERO ID:	7325487			
Conditions of Use:	Processing as a reactant: Intermediate in all other basic organic chemical manufacture			
EXTRACTION				
Parameter	Data			
Process description:	Ethyl chloride production Ethylene gas and hydrogen chloride are mixed in equimolar proportions before being fed to a reactor which contains EDC or a mixture of EDC and ethyl chloride. Hydrochlorination of ethylene occurs in the presence of an aluminum chloride catalyst. The gaseous reaction products are charged to a separation column or flash drum to remove heavy polymer bottoms and then to a fractionation column for final product purification.			
Number of sites:	5			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Methodology	High	USEPA
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US
	Metric 3:	Applicability	High	The report is for an occupational scenario (Ethyl chloride production) within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	1984 - more than 20 years old
	Metric 5:	Sample Size	N/A	Qualitative information provided
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	Qualitative information provided
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.				
HERO ID:	7325487				
Conditions of Use:	Processing as a reactant: Intermediate				
EXTRACTION					
Parameter	Data				
Process description:	Polysulfide rubber production Polysulfide rubber production is a synthetic rubber polymer which is used in the manufacture of caulking putties, cements, sealants, and rocket-fuel. It is produced by the reaction between aliphatic halides, such as EDC, and alkali polysulfides such as Na2S4. The main products of the reaction are the polysulfide rubber chain, (CH2CH2-S4)n, and sodium chloride.				
EVALUATION					
Domain	Metric		Rating		Comments
Domain 1: Reliability	Metric 1:	Methodology	High	USEPA	
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US	
	Metric 3:	Applicability	High	The report is for an occupational scenario (Polysulfide rubber production) within the scope of the risk evaluation.	
	Metric 4:	Temporal Representativeness	Low	1984 - more than 20 years old	
	Metric 5:	Sample Size	N/A	Qualitative information provided	
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources	
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	Qualitative information provided	
Overall Quality Determination			High		

Study Citation: U.S. EPA, (1984). Locating and estimating air emissions from sources of ethylene dichloride.	
HERO ID: 7325487	
Conditions of Use: Processing as a reactant: Incorporation into formulation, mixture, or reaction product	
EXTRACTION	
Parameter	Data
Process description:	LIQUID PESTICIDE FORMULATIONPesticide formulation systems are typically batch mixing operations. Technical grade pesticide is usually stored in its original shipping container in the warehouse section of the plant until it is needed. If the material is received in bulk, it is transferred to holding tanks for storage. Solvents are normally stored in bulk tanks. Batch mixing tanks are typically closed vessels. The components of the formulation are fed into the tank, measured by weight, and mixed by circulation with a tank pump. The formulated material is then pumped to a holding tank before being put into containers for shipment. The blend tank is vented to the atmosphere through a vent dryer, which prevents moisture from entering the tank. Storage and holding tanks and container-filling lines may be provided with an exhaust connection or hood to remove any vapors. The exhaust from the system may be vented to a control device or directly to the atmosphere.
EVALUATION	
Domain	Metric
Domain 1: Reliability	Rating
Metric 1:	Methodology
	High USEPA
Domain 2: Representativeness	
Metric 2:	Geographic Scope
Metric 3:	Applicability
	High US
Metric 4:	Temporal Representativeness
Metric 5:	Sample Size
	High The report is for an occupational scenario (LIQUID PESTICIDE FORMULATION) within the scope of the risk evaluation.
	Low 1984 - more than 20 years old
	N/A Qualitative information provided
Domain 3: Accessibility/ Clarity	
Metric 6:	Metadata Completeness
	High Assessment or report clearly documents its data sources
Domain 4: Variability and Uncertainty	
Metric 7:	Metadata Completeness
	N/A Qualitative information provided
Overall Quality Determination	
High	

Study Citation:	U.S. EPA, (2021). National analysis TRI dataset (TRI): Data used for TSCA risk evaluations, reporting year 2019.			
HERO ID:	8347325			
Conditions of Use:	All conditions of use			
EXTRACTION				
Parameter	Data			
Number of sites:	76 sites reported in TRI.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for all conditions of use.	
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	Low	Sample distribution is described qualitatively.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by data from multiple facilities.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2023). AP-42: Chapter 5 - Petroleum industry.			
HERO ID:	9102566			
Conditions of Use:	Fuels and fuel additives: all other petroleum and co			
EXTRACTION				
Parameter	Data			
Process description:	Petroleum refinery activities start with receipt of crude forstorage at the refinery, include all petroleum handling and refining operations and terminate with storagepreparatory to shipping the refined products from the refinery. Listed are 5 categories of general refinery processes and associated operations: Separation Processes, petroleum conversion, petroleum treating, feedstock and product handling, and auxiliary facilities. Figure 5.1-1 (pg. 2/21) provides process schematic.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods thatare from frequently used sources
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evalu-ated.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, andassumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	process description
Overall Quality Determination			High	

Study Citation:	UNEP, (1988). News about chemicals. International Register of Potentially Toxic Chemicals Bulletin 9(1):19.			
HERO ID:	5436106			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	World production in 1981 was 23,000 (kilotonnes) (Pg. 16)			
Life cycle description:	”The major industrial use of 1,2-dichloroethane is in the synthesis of vinyl chloride (approximately 85% of total production). Other chemicals produced from 1,2-dichloroethane are 1,1,1-trichloroethane and tetrachloroethylene. Other smaller uses as a lead scavenger in petrol, solvent and fumigant applications.”			
Process description:	”Two processes are used in the production of 1,2-dichloroethane, and they are very often combined into one so-called ‘balanced process.’ The first is the vapour or liquid phase reaction of chlorine with ethene in the presence of a catalyst, usually 1,2-dibromomethane or metal chlorides. The second is the reaction of ethene with oxygen and hydrogen chloride in the presence of the catalyst, copper (II) chloride.”			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from worldwide.
	Metric 3:	Applicability	High	Data are for manufacture, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Data is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Low	

Study Citation:	VI, (2020). Comment submitted by Vinyl Institute regarding EDC impurities.			
HERO ID:	11182965			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	30 billion lbs. [PDF Pg. 5 of 6]			
Process description:	As VI previously explained, impurities are contained in mixed chlorinated organics unintentionally produced during the catalytic oxychlorination of ethylene to make EDC, the raw material precursor for conversion by thermal cracking into vinyl chloride monomer (VCM). The EDC and VCM manufacturing processes often take place in integrated facilities that include direct chlorination of ethylene and, when combined, are known in the industry as “the balanced process.” In the U.S., roughly equal volumes of EDC are produced using two production processes (direct chlorination and oxychlorination). Most U.S. producers use both processes at a facility, and this is termed a balanced operation. VI is aware of four operating direct chlorination facilities not integrated within a balanced facility. About 1.25 pounds of mixed chlorinated organic liquids are unintentionally produced per 100 pounds of EDC manufactured. Because these substances are impurities, the production process is designed to remove them from the finished product using a separation process based on differences between the boiling point of EDC and the boiling points of these three substances. Impurities inadvertently produced during EDC manufacture are predominantly converted via other processes into various feedstocks such as HCl, or used in co-located perchloroethylene units, or destroyed by thermal oxidation with minimal if any direct worker exposure. [PDF Pg. 2-3 of 6. Please see document for additional content and description]			
Number of sites:	18 [PDF Pg. 5 of 6]			
Chemical concentration:	Composition, given in weight % [PDF Pg. 4 of 6]Light Ends: 10-85Heavy Liquid Ends: 8-75EDC Product: 99.4-100VCM Manufacture: 0-0.001Yields lb/100lb EDC produced) [PDF Pg. 4 of 6]Light Ends: 0.03-0.266Heavy Liquid Ends: 0.075-0.703EDC Product: 99.4-100VCM Manufacture: 0-0.001			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	Medium	Data are presented in a range.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by describing concentrations and yields in light ends, heavy ends, and EDC product, but uncertainty is not addressed.	
Overall Quality Determination		High		

Study Citation:	VI, (2017). Comment submitted by Richard Krock, Vice President, Regulatory and Technical Affairs, The Vinyl Institute (VI) on carbon tetrachloride, methylene chloride, trichloroethylene, and tetrachloroethylene.			
HERO ID:	11927368			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Process description:	VI's comments specifically pertain to amounts of four chlorinated organics (carbon tetrachloride, methylene chloride, trichloroethylene, and tetrachloroethylene) that are unintentionally produced during the catalytic oxychlorination of ethylene to make ethylene dichloride (EDC), the raw material precursor for conversion by thermal cracking into vinyl chloride monomer (VCM). The processes take place in integrated facilities along with direct chlorination of ethylene and, when combined, are known in the industry as “the balanced process”.			
Chemical concentration:	Carbon tetrachloride, 30% in light liquid ends... (see Table 1 on page 3 of 8 for remaining byproduct concentrations).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for manufacturing, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination		High		

Study Citation:	VI, (2020). Comment submitted by Richard Krock, Vice President, Regulatory and Technical Affairs, The Vinyl Institute (VI) on 1,1-dichloroethane, trans-1,2-dichloroethylene, and 1,1,2-trichloroethane.
HERO ID:	11927540
Conditions of Use:	Manufacturing

EXTRACTION	
Parameter	Data
Process description:	Impurities inadvertently produced during EDC manufacture are predominantly converted via other processes into various feedstocks such as HCl, or used in co-located perchloroethylene units, or destroyed by thermal oxidation with minimal if any direct worker exposure. At most facilities, both the light and heavy end liquids recovered are typically used as feedstocks in a RCRA-permitted furnace or Hazardous Waste Incinerator to produce stronger HCl for oxychlorination feedstock or weaker muriatic acid, or the recovered light and heavy end liquids are used in the Catoxid® process to manufacture anhydrous HCl, which is returned as a feedstock with its coproduct EDC to the front of the oxychlorination EDC process. In each process, quantities of impurities are converted to feedstocks and essentially eliminated. Because of a purification step, limited quantities of impurities are expected in the EDC intermediate that is converted to VCM monomer as shown in Table 2. Any unconverted EDC or residual impurity remaining after thermal cracking to form vinyl chloride is separated and returned to the EDC unit for further chlorination and then subsequently separated as a component of light or heavy ends in the EDC purification process. At some facilities that are co-located with other organochloride production units, heavy ends can also be used as a feedstock in units designed to produce commercial 1,1,2-Trichloroethane.
Chemical concentration:	See Table 1 for composition of each byproduct chemical.

		EVALUATION	
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	High	Data are for manufacturing, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5: Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination	High
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Study Citation:	VI, (2026). Vinyl Institute comments on 1,2-dichloroethane regarding working year data and inhalation monitoring data.			
HERO ID:	13245902			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Number of sites:	VI EDU Consortium provided additional inhalation monitoring data from eight facilities (Table 6)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for manufacture, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old. (2026)	
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination		High		

Study Citation:	WHO, (1987). 1,2-Dichloroethane. 62(0):4-1 - 4-21.			
HERO ID:	22964			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	1979 world production: 23,130 (kilotonnes) (Pg. 1); 1974 U.S.: 4,160 (kilotonnes); 1977 U.S.: 4,750 (kilotonnes)			
Life cycle description:	80-90% of DCE is used for vinyl chloride; also used to make ethylene diamine, lead scavenger in gasoline, solvent and fumigant; extraction in the pharmaceutical industry or crystallinzation in the chemical industry			
Process description:	DCE is derived from ethene via catalyzed reaction with chlorine or with oxygen and hydrogen chloride.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Europe, which comprises of mostly OECD countries.
	Metric 3:	Applicability	High	Data are for manufacturing an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Low	Report is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by multiple year production volumes but uncertainty is not addressed.
Overall Quality Determination			Medium	