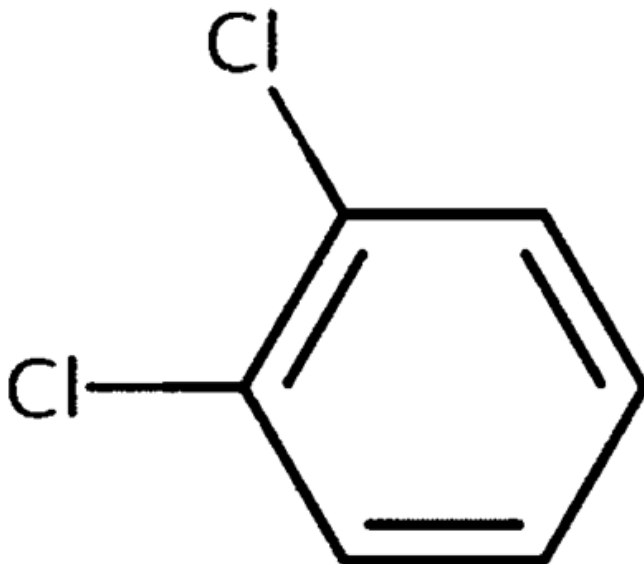

**Draft Data Quality Evaluation and Data Extraction Information for
Environmental Release and Occupational Exposure for
o-Dichlorobenzene**

Systematic Review Support Document for the Draft Risk Evaluation

CASRN: 95-50-1



June 2026

This supplemental file contains information regarding the data extraction and quality evaluation results for data sources that were considered for the *Draft Risk Evaluation for o-Dichlorobenzene (o-DCB)* 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* (referred to hereafter '2021 Draft Systematic Review Protocol').

Data that met the RESO (Receptors, Exposure, Setting or Scenario, and Outcomes) 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		
1441172	Bakoğlu, M., Karademir, A., Ayberk, S. (2004). An evaluation of the occupational health risks to workers in a hazardous waste incinerator. Journal of Occupational Health 46(2):156-164.	12
1990090	Chrostek, W. J., Thoburn, T. W. (1976). Health Hazard Evaluation Determination Report No. HHE-74-107-279, General Electric Company, Silicone Products Department, Waterford, New York. NIOSH(HHE-74-107-279):74-107.	13
13171505	Company Withheld (2024). o-Dichlorobenzene: Occupational inhalation exposure assessment results summary (redacted).	14
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666726	IARC, (1999). Some chemicals that cause tumours of the kidney or urinary bladder in rodents and some other substances.	20
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3001610	Jung, P. K., Kim, I., Park, I., Kim, C., Kim, E. A., Roh, J. (2014). A case of multiple myeloma in a poultry worker. Annals of Occupational and Environmental Medicine 26(1):35.	23
5254957	Kumagai, S., Matsunaga, I. (1997). Relations between exposure to o-dichlorobenzene and concentrations of urinary metabolites. Journal of Occupational Health 39(2):124-129.	24
1056993	Nagasawa, Y., Ukai, H., Okamoto, S., Samoto, H., Itoh, K., Moriguchi, J., Sakuragi, S., Ohashi, F., Takada, S., Kawakami, T., Ikeda, M. (2011). Organic solvent use in enterprises in Japan. Industrial Health 49(4):534-541.	25
3859376	NIOSH, (1981). Health Hazard Evaluation report no. HETA 81-065-938, METRO Bus Maintenance Shop, Washington, DC.	26
5185293	OECD, (2001). SIDS initial assessment report for 13th SIAM: 1,2-Dichlorobenzene.	27
4930013	Olin Chemicals, (1987). Industrial hygiene sampling for toluene diisocyanate at Olin Moundsville plant.	29
4930031	Olin Chemicals, (1987). Industrial hygiene sampling for toluene diisocyanate at Olin Chemical Moundsville plant.	30
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11224653	U.S. EPA, (2013). Updating CEB's method for screening-level estimates of dermal exposure.	32
5249945	Violante, F. S., Milani, S., Malenchini, G., Barbieri, A. (2005). Chloracne due to o-dichlorobenzene in a laboratory worker. Contact Dermatitis 52(2):108.	33

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3808976	OECD, (2011). Emission scenario document on coating application via spray-painting in the automotive refinishing industry.	41
6385735	OECD, (2020). Emission scenario document on chemical additives used in automotive lubricants.	42
6311222	Science Applications International Corporation, (1996). Generic scenario for automobile spray coating: Draft report.	43
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6311221	U.S. EPA, (2001). Manufacture and use of printing ink - Generic scenario for estimating occupational exposures and environmental releases (revised draft).	52
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6385709	U.S. EPA, (1999). Flexographic printing - generic scenario for estimating occupational exposures and environmental releases: Draft.	55
6385719	U.S. EPA, (2004). Spray coatings in the furniture industry - generic scenario for estimating occupational exposures and environmental releases: Draft.	56
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1267867	Burgess, W. A. (1991). Potential exposures in the manufacturing industry—Their recognition and control. :595-674.	60
664488	CDC, (2009). Fourth national report on human exposure to environmental chemicals.	62
4214362	Dow Chemical, (1992). Letter from Dow Chem Co submitting several studies with trichloroethylene and other chemicals in humans with attachments (sanitized).	63
6558535	Heitbrink, W. (1993). In-depth survey report: Control technology for autobody repair and painting shops at Team Chevrolet, Colorado Springs, Colorado.	64
6558536	Heitbrink, W., Cooper, T., Edmonds, M., Bryant, C., Ruch, W. (1993). In-depth survey report: control technology for autobody repair and painting shops at Valley Paint and Body Shop, Amelia, Ohio.	65
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10366189	U.S. EPA, (2020). 2020 CDR: Commercial and consumer use.	73
13246149	U.S. EPA, (2026). Chemical Data Reporting (CDR): Reporting year 2024.	75
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5160103	ATSDR, (2006). Toxicological profile for dichlorobenzenes.	81
5251828	Brown, S. L., Chan, F. Y., Jones, J. L., Liu, D. H., Mccaleb, K. E. (1975). Research program on hazard priority ranking of manufactured chemicals (Chemicals 21-40).	83
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659922	Dempsey, C. R. (1993). A comparison of organic emissions from hazardous waste incinerators versus the 1990 toxics release inventory air releases. <i>Journal of the Air and Waste Management Association</i> 43(10):1374-1379.	86
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5255836	Love, O. T., Jr, Miltner, R. J., Eilers, R. G., Fronk-Leist, C. A. (1983). Treatment of volatile organic compounds in drinking water.	99
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87136	Middleton, P., Sockwell, R., Carter, L., W.P. (1990). Aggregation and analysis of volatile organic compound emissions for regional modeling. <i>Atmospheric Environment, Part A: General Topics</i> 24(5):1107-1133.	102
1269556	Midwest Research Institute, (1984). Performance evaluation of full-scale hazardous waste incinerators - Volume I (excutive summary) contract no. 68-02-3177 (43).	103
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13243357	U.S. EPA, (2023). Toxics Release Inventory (TRI) data: o-Dichlorobenzene (oDCB), reporting years 2019-2023.	117
46492	U.S. EPA, (1995). AP-42: Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition.	118
6385710	U.S. EPA, (2010). Manufacture and use of printing inks - generic scenario for estimating occupational exposures and environmental releases: Draft.	119
8347325	U.S. EPA, (2021). National analysis TRI dataset (TRI): Data used for TSCA risk evaluations, reporting year 2019.	121
8784984	U.S. EPA, (2019). TRI on-site and off-site reported disposed of or otherwise released (in pounds), for all industries.	122
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2529906	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.	124
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3827298	OECD, (2009). Emission scenario documents on coating industry (paints, lacquers and varnishes).	127
3827416	OECD, (2004). Emission scenario document on lubricants and lubricant additives.	128
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6311222	Science Applications International Corporation, (1996). Generic scenario for automobile spray coating: Draft report.	132
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6385709	U.S. EPA, (1999). Flexographic printing - generic scenario for estimating occupational exposures and environmental releases: Draft.	144
6385719	U.S. EPA, (2004). Spray coatings in the furniture industry - generic scenario for estimating occupational exposures and environmental releases: Draft.	145
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664488	CDC, (2009). Fourth national report on human exposure to environmental chemicals.	146
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7310513	U.S. EPA, (1995). Chapter 6: Organic chemical process industry. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.	156
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3827298	OECD, (2009). Emission scenario documents on coating industry (paints, lacquers and varnishes).	160
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11360398	Milbrandt, A., Coney, K., Badgett, A., Beckham, G. T. (2022). Quantification and evaluation of plastic waste in the United States. Resources, Conservation and Recycling 183:106363.	212
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10366189	U.S. EPA, (2020). 2020 CDR: Commercial and consumer use.	227
13246149	U.S. EPA, (2026). Chemical Data Reporting (CDR): Reporting year 2024.	230
6275311	U.S. EPA, (2020). 2020 CDR data.	231
6385710	U.S. EPA, (2010). Manufacture and use of printing inks - generic scenario for estimating occupational exposures and environmental releases: Draft.	232
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Study Citation:	Bakoğlu, M., Karademir, A., Ayberk, S. (2004). An evaluation of the occupational health risks to workers in a hazardous waste incinerator. Journal of Occupational Health 46(2):156-164.			
HERO ID:	1441172			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation			
Physical form:	Vapor			
Area sampling data:	”Sampling point 1: 4.56 ppb Sampling point 2: 14.86 ppb”			
Comments:	2 samples, In front of the rotary kiln and near the fly ash transfer line from the ash silo, 16-24 hr samples			
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 method (EPA 8260)
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Turkey (OECD)
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	Operations, equipment, and worker activities are expected to be reasonably representative of current conditions. The monitoring data were collected after the most recent PEL establishment or update but are generally more 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	Metadata given, but no exposure frequency information
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.
Overall Quality Determination		High		

Study Citation:	Chrostek, W. J., Thoburn, T. W. (1976). Health Hazard Evaluation Determination Report No. HHE-74-107-279, General Electric Company, Silicone Products Department, Waterford, New York. NIOSH(HHE-74-107-279):74-107.			
HERO ID:	1990090			
Conditions of Use:	Processing			
EXTRACTION				
Parameter	Data			
Life cycle description:	Solvents (which become part of product formulation or mixture) in Plastic material and resin manufacturing; Synthetic rubber manufacturing			
Worker activity description:	Molding compound area, separator area, Operator-mechanics			
Exposure route:	Inhalation			
Physical form:	Liquid, vapor			
Area sampling data:	Sample concentrations ranged from non detect - 329 mg/m3 for chlorobenzene			
Exposure duration:	7hrs (8am - 4 PM)			
Exposure frequency:	samples: 34 - 440 min			
Personal protective equipment:	respiratory protective equipment			
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	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	Data from 1976 (before the PEL)
	Metric 5:	Sample Size	High	Raw sample data provided
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Uninformative	Metadata provided for samples, however these samples only describe concentrations for chlorobenzene. No sample data for o-DCB.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Variability and uncertainty discussed in methodology
Overall Quality Determination		Uninformative		

Study Citation:	Company Withheld (2024). o-Dichlorobenzene: Occupational inhalation exposure assessment results summary (redacted).			
HERO ID:	13171505			
Conditions of Use:	Industrial Use of Solvents			
EXTRACTION				
Parameter	Data			
Worker activity description:	SEGs include High Performance Polymers ChemicalOperators, High Performance Copolymer ChemicalOperators, Maintenance Mechanics/Electricians, and High Performance Polymers Support Personnel (Engineers, Managers, etc.). Detailed tasks are provided in Appendix A.			
Exposure route:	Monitoring data is for inhalation exposure, but the report mentions dermal exposure is possible.			
Physical form:	Liquid			
Personal sampling data:	Sample results are presented on page 6, and detailed in Appendix B.			
Exposure duration:	8 hours/day (pg. 6)			
Exposure frequency:	Tasks are labeled as either daily, or 5 times per year			
Personal protective equipment:	FR Uniform, chemical suit (when necessary), Leather or nitrile gloves, safety shoes, safety glasses, hard hat, hearing protection			
Engineering control:	Closed Loop Process, Local and General Exhaust Ventilation or Outdoors, Lab Fume Hood, ventilated sample point.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling is via NIOSH 1003.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for Industrial Use of Solvents, an in-scope OES.
	Metric 4:	Temporal Representativeness	High	Data are from 2024.
	Metric 5:	Sample Size	High	Discrete sampling data is provided.
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	Uncertainty can be determined from the sampling and analysis methods. Variability is addressed by sampling on different days in various locations.
Overall Quality Determination		High		

Study Citation:	Dow Chemical, (1984). Comprehensive industrial hygiene survey for monochlorobenzene and the isomers of dichlorobenzene at the Michigan division chlorobenzol plant.			
HERO ID:	2048380			
Conditions of Use:	Processing			
EXTRACTION				
Parameter	Data			
Life cycle description:	Organic chemical manufacturing			
Number of sites:	1			
Worker activity description:	Badger, Chlorinator, tri-Tetrachlor operator, Still Operator, Chlorobenzol operator			
Exposure route:	Inhalation			
Physical form:	Liquid, vapor			
Personal sampling data:	82 Personal samples range from: N.D. - 7.95 ppm (document is difficult to read)			
Exposure duration:	Exposures provided in 8-hr TWA			
Number of workers:	38			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Methods are well documented and assumed to be accurate. Study performed by DOW Chemical
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data from the US
	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 1979 (before the PEL)
	Metric 5:	Sample Size	High	Raw sample data provided
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Methods and assumptions are clearly described
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The monitoring study addresses variability in the determinants of exposure for the sampled site or sector. The monitoring study addresses uncertainty in the exposure estimates or uncertainty canbe determined from the sampling and analytical method.
Overall Quality Determination			High	

Study Citation:	Dow Chemical, (1981). Comprehensive industrial hygiene survey for the Michigan division organic chemicals production department distribution center and warehouse, and buildings. :29-37.			
HERO ID:	5285554			
Conditions of Use:	Distribution in Commerce			
EXTRACTION				
Parameter	Data			
Number of sites:	1			
Worker activity description:	drumming, weighing			
Exposure route:	inhalation			
Physical form:	vapor			
Personal sampling data:	1.2 - 3.2 ppm			
Area sampling data:	0.98 ppm - 5.7 ppm			
Comments:	short-term and 6-8 hr TWA280 - 345 minutes samplesamples taken at distribution center			
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 from US
	Metric 3:	Applicability	High	Data is for distribution in commerce (in scope)
	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 exposure frequency.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed between worker activities but uncertainty was not addressed
Overall Quality Determination			High	

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/Manufacturing			
EXTRACTION				
Parameter	Data			
Personal sampling data:	personal sampling results for o-DCB - non-detect			
Area sampling data:	Ambient air concentration for o-DCB ranged between 17 - 1319 ng/m3			
Personal protective equipment:	Most production employees are protected by respirators, protective clothing and shower after each shift.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	analytical method is approved and well described
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US data
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	data greater than 20 years old
	Metric 5:	Sample Size	High	Discrete data points
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		High		

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:	Study states that samples were taken around the waste sites, near homes. Average o-DCB measurements ranged from 0.04 ppb - 0.86 ppb with a max of 8.4 ppb.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling or analytical methodology 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	Low	The data are for a non-occupational scenario that is similar scenario within the scope of the risk evaluation (disposal).
	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	Medium	Distribution of samples is characterized by a range with uncertain statistics (averages)
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	High	The monitoring study addresses variability in the determinants of exposure for the sampled site or sector. The monitoring study addresses uncertainty in the exposure estimates or uncertainty can be determined from the sampling and analytical method.
Overall Quality Determination		Medium		

Study Citation:	IARC, (1982). IARC monographs on the evaluation of the carcinogenic risk of chemicals to humans: Some industrial chemicals and dyestuffs. IARC monographs on the evaluation of carcinogenic risks to humans 29:1-398.			
HERO ID:	27010			
Conditions of Use:	Manufacturing, Processing, Use			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation			
Physical form:	Vapor			
Area sampling data:	”The air in a chlorobenzene factory was found to contain 24-34 ppm [144- 204 mg/m3] para-dichlorobenzene; levels of ortho-dichlorobenzene were up to 25% of those for the para isomer. ortho-dichlorobenzene is a component of the gaseous emissions from the production of silicone medical tubing(20mg/m3); A survey in the late 1930s of three woollen mills where ortho-dichlorobenzene was used as a solvent reported vapour concentrations in workplace air to be 60-1620 mg/m3 ”			
Number of workers:	Industry total: 10,000 (during production, processing and industrial solvent use) and 2,000,000 (for all occupational activities); 200(fumes in transmission shops)			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Methodology not described, however the data is from the EPA so it is assumed to be reliable
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US data
	Metric 3:	Applicability	Medium	Related to CoU (silicone medical tubing manufacturing and wool mills)
	Metric 4:	Temporal Representativeness	Low	Monitoring 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	Sample type provided but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability between 3 woollen mills, uncertainty not described
Overall Quality Determination		Medium		

Study Citation:	IARC, (1999). Some chemicals that cause tumours of the kidney or urinary bladder in rodents and some other substances.			
HERO ID:	666726			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation			
Physical form:	liquid, vapor			
Personal sampling data:	Below LOD - 13.7 mg/m3			
Number of workers:	approximately 92 000 workers in the United States (total)			
Comments:	TWA, PBZ			
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 method.
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	Report from 1999 (after the PEL but more than 20 years ago)
	Metric 5:	Sample Size	Low	Only average and ranges provided, no other statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sample type and exposure type given, but no other metadata provided
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:	IARC, (1999). Some chemicals that cause tumours of the kidney or urinary bladder in rodents and some other substances.			
HERO ID:	666726			
Conditions of Use:	Processing			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation			
Physical form:	liquid, vapor			
Personal sampling data:	Dye manufacturing: 0.3 - 14 mg/m3 Dye intermediate processing: 0.1 - 2.3 ppm, TWA			
Number of workers:	approximately 92 000 workers in the United States (total) 10 workers in the intermediate plant			
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 method
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	Report from 1999 (after the PEL but more than 20 years ago)
	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 given, but no other metadata provided
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.
Overall Quality Determination		High		

Study Citation:	IPCS, (1991). Chlorobenzenes other than hexachlorobenzene.			
HERO ID:	81628			
Conditions of Use:	Use			
EXTRACTION				
Parameter	Data			
Worker activity description:	Workers in pathology laboratory			
Exposure route:	inhalation			
Physical form:	vapor			
Area sampling data:	no air monitoring was carried out, the symptoms reported by 22 out of the 26 subjects were consistent with those produced at exposure levels in excess of 600 mg/m3 (100 ppm)			
Exposure duration:	Exposed for 8 hrs/day			
Exposure frequency:	over 4 days			
Number of workers:	26			
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	US data
	Metric 3:	Applicability	High	In-scope use (laboratory chemicals)
	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	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:	Jung, P. K., Kim, I., Park, I., Kim, C., Kim, E. A., Roh, J. (2014). A case of multiple myeloma in a poultry worker. Annals of Occupational and Environmental Medicine 26(1):35.			
HERO ID:	3001610			
Conditions of Use:	Fumigant			
EXTRACTION				
Parameter	Data			
Worker activity description:	fumigating sheds (2/6)			
Exposure route:	inhalation (2/6)			
Physical form:	spray mist (2/6)			
Exposure duration:	1 hr/day (2/6)			
Exposure frequency:	5-6 applications in 2 months, so 30-36 days/yr (2/6)			
Number of workers:	1 worker (1/6)			
Engineering control:	Two air intake and exhaust ventilators, six ventilator fans (2/6)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Report uses NIOSH methods, which is a frequently used source.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Korea, an OECD country.
	Metric 3:	Applicability	Uninformative	The report is for fumigants, which is a non-TSCA use.
	Metric 4:	Temporal Representativeness	High	Report is from 2014, which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Exposure duration and frequency are provided as ranges with uncertain statistics.
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 in providing ranges for exposure duration and frequency. Uncertainty isn't addressed.
Overall Quality Determination		Uninformative		

Study Citation:	Kumagai, S., Matsunaga, I. (1997). Relations between exposure to o-dichlorobenzene and concentrations of urinary metabolites. Journal of Occupational Health 39(2):124-129.
HERO ID:	5254957
Conditions of Use:	Processing: Solvent in synthetic dye and pigment manufacturing

EXTRACTION	
Parameter	Data
Number of sites:	1
Exposure route:	inhalation
Physical form:	vapor
Personal sampling data:	"Worker A: The 1-hrTWAs for o-DCB ranged from 0.1 to 7.9 ppm (mean (SD)=2.1 ppm (2.5 ppm)). Worker B: The 1-hr TWA values varied from 0.1 to 8.8 ppm (mean (SD)=1.4 ppm (2.9 ppm))"
Exposure duration:	9 hours 8:00-1700
Number of workers:	10

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	Medium	Data from Japan (OECD)
	Metric 3:	Applicability	High	Data is for synthetic dye manufacturing (in scope)
	Metric 4:	Temporal Representativeness	Medium	Monitoring data were collected after the most recent PEL and greater than 10 years old.
	Metric 5:	Sample Size	Medium	Samples characterized by range with uncertain statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sample type and exposure type provided but missing exposure frequency.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed between the workers but uncertainty was not addressed

Overall Quality Determination	Medium
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Study Citation:	Nagasawa, Y., Ukai, H., Okamoto, S., Samoto, H., Itoh, K., Moriguchi, J., Sakuragi, S., Ohashi, F., Takada, S., Kawakami, T., Ikeda, M. (2011). Organic solvent use in enterprises in Japan. Industrial Health 49(4):534-541.		
HERO ID:	1056993		
Conditions of Use:	Processing / Use		
EXTRACTION			
Parameter	Data		
Exposure route:	Inhalation		
Physical form:	vapor		
Area sampling data:	o-DCB was detected in less than 1% of samples		
Comments:	Analytic method: workroom air sampling (by the Tedlar bag method) and instrumental analyses (by capillary gas-chromatography)		
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 Japan, an OECD country. other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure limits, industry/ process technologies) may impact exposures relative to the U.S.
	Metric 3: Applicability	Low	No specific in-scope uses or exposure scenarios are described (solvent use). Information may be applicable to in-scope CoU's for solvent use
	Metric 4: Temporal Representativeness	Medium	Data from 2011 (< 10 years)
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Uninformative	Monitoring data do not include any needed metadatato understand what the data represent and are not usable in the risk evaluation. No sample information was provided, only told that o-DCB was detected in 0-1% of work spaces
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:	NIOSH, (1981). Health Hazard Evaluation report no. HETA 81-065-938, METRO Bus Maintenance Shop, Washington, DC.			
HERO ID:	3859376			
Conditions of Use:	Use-Degreasers			
EXTRACTION				
Parameter	Data			
Number of sites:	1			
Worker activity description:	Bus maintenance repair shop - degreasing activities			
Exposure route:	Inhalation			
Physical form:	Vapor			
Personal sampling data:	Dichlorobenzene was below the LOD of 0.03 mg/m3			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is an approved NIOSH method.
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	Data are for degreasing, 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 exposure duration and frequency.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty is addressed in sampling/analytical methodology but variability is not addressed.
Overall Quality Determination		High		

Study Citation:	OECD, (2001). SIDS initial assessment report for 13th SIAM: 1,2-Dichlorobenzene.			
HERO ID:	5185293			
Conditions of Use:	Manufacturing, Processing			
EXTRACTION				
Parameter	Data			
Life cycle description:	Manufacturing (foreign), General Formulation			
Number of sites:	1			
Exposure route:	inhalation			
Physical form:	Liquid, vapor			
Personal sampling data:	Occupational exposures levels were estimated by use of the UK EASE model. For formulation, levels were estimated to be 0.5 to 3 ppm (8 hour TWA) at 20oC, assuming a non-dispersive pattern of use with local exhaust ventilation present. Dermal exposure is unlikely to contribute significantly. Information on workplace exposure to the chemical from production and processing is presented by way of example of the largest producer for a site in Germany. During the past five years (1997 - 2001) 21 samples were taken. All measurements were less than 15 mg/m3.			
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 from Germany (OECD)
	Metric 3:	Applicability	High	Data are for foreign manufacturing and formulation (assumed degreasers), which may be applicable to domestic manufacturing and formulation (in-scope)
	Metric 4:	Temporal Representativeness	Medium	Monitoring data were collected after the most recent PEL and greater 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	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:	OECD, (2001). SIDS initial assessment report for 13th SIAM: 1,2-Dichlorobenzene.			
HERO ID:	5185293			
Conditions of Use:	Use of Degreasers			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation			
Physical form:	Liquid, vapor			
Personal sampling data:	Exposure values of 10 to 50 ppm (8 hour TWA) at 25oC were obtained for end-use assuming a non-dispersive pattern of use and no aerosol formation. Dermal exposure is likely to be incidental during an 8-hour day.			
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 from Germany (OECD)
	Metric 3:	Applicability	High	CoU in-scope (use of degreasers)
	Metric 4:	Temporal Representativeness	Medium	Monitoring data were collected after the most recent PEL and greater 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	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:	Olin Chemicals, (1987). Industrial hygiene sampling for toluene diisocyanate at Olin Moundsville plant.			
HERO ID:	4930013			
Conditions of Use:	Industrial use			
EXTRACTION				
Parameter	Data			
Area sampling data:	Amount of o-DCB – 45.177 ug/sample equivalent to 3.06 ppm. Total volume sampled – 2.4 liters.			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling methodology is an approved NIOSH method
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States
	Metric 3:	Applicability	High	The data are 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	characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Monitoring data include sample type 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		Medium		

Study Citation:	Olin Chemicals, (1987). Industrial hygiene sampling for toluene diisocyanate at Olin Chemical Moundsville plant.			
HERO ID:	4930031			
Conditions of Use:	industrial use			
EXTRACTION				
Parameter	Data			
Area sampling data:	Amount of o-DCB – 11.829 ug/sample equivalent to 0.85 ppm. Total volume sampled – 2.4 liters.			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling methodology is an approved NIOSH method
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States
	Metric 3:	Applicability	High	The data are 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	characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Monitoring data include sample type 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		Medium		

Study Citation:	OSHA, (2019). Chemical exposure health data (CEHD) sampling results: CASRNs 75-34-3, 85-68-7, 84-74-2, 78-87-5, 117-81-7, 106-93-4, 50-00-0, 95-50-1, 85-44-9, 106-46-7, 79-00-5, and 115-86-6.
HERO ID:	6499659
Conditions of Use:	use

EXTRACTION

Parameter	Data
Personal sampling data:	o-DCB concentrations (ppm): min - 0, max - 23.6, average - 0.513, # detected - 38, # samples - 128
Area sampling data:	o-DCB concentrations (ppm): min - 0, max - 3.5, # of samples - 69, # detected - 1

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	High	Assume that OSHA uses an OSHA method to collect samples
Domain 2: Representativeness	Metric 2: Geographic Scope	High	US data
	Metric 3: Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	Data ranges from 1984 to 2000
	Metric 5: Sample Size	High	Discrete data points
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	No background information is provided that would help understand the data.

Overall Quality Determination**Medium**

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			
Exposure route:	Dermal			
Physical form:	Solids and liquids. Table 1 presents different scenarios of handling solids and liquids and the resulting dermal exposure to hands.			
Dermal exposure data:	Table 1 presents different scenarios of handling solids and liquids and the resulting dermal exposure to hands.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Assessment uses high quality data/techniques/methods 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 evaluated.
	Metric 3:	Applicability	Medium	The estimates are for an occupational scenario within the scope of the risk evaluation. However, the estimates are not chemical-specific.
	Metric 4:	Temporal Representativeness	Medium	More than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Low	The data is not characterized by statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment clearly documents results and data sources. However, the underlying methods and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Violante, F. S., Milani, S., Malenchini, G., Barbieri, A. (2005). Chloracne due to o-dichlorobenzene in a laboratory worker. Contact Dermatitis 52(2):108.			
HERO ID:	5249945			
Conditions of Use:	Use: Laboratory chemicals			
EXTRACTION				
Parameter	Data			
Number of sites:	1			
Exposure route:	Dermal, Inhalation			
Physical form:	liquid, vapor			
Area sampling data:	0.8–2.2 p.p.b in air			
Exposure frequency:	3 months-The patient was removed from further exposure			
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	Medium	Data from Italy (OECD)
	Metric 3:	Applicability	High	Data is for laboratory use (in scope)
	Metric 4:	Temporal Representativeness	Medium	Monitoring data were collected after the most recent PEL but are more than 10 years old and no greater than 20 years old.
	Metric 5:	Sample Size	Medium	Samples characterized by range with uncertain statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sample type and exposure type provided but missing exposure frequency.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are 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:	Processing as a reactant			
EXTRACTION				
Parameter	Data			
Worker activity description:	Four chemical and oil company workers, a sewage treatment worker			
Exposure route:	inhalation			
Physical form:	vapor			
Personal sampling data:	TEAM study in New Jersey. 18 breath samples were taken for the worker, all were below the LOD of 0.10 µg/m3			
Exposure duration:	5-10 hr samples			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	TEAMS study. Methods are known and assumed to be accurate.
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 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, however the source is not specific about the specific worker activities.
	Metric 4:	Temporal Representativeness	Low	Data is from 1983, more than 20 years old and before PEL
	Metric 5:	Sample Size	Medium	Sample data provided as ranges with statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sample type and exposure type given, but no other metadata provided.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty addressed in analysis of data, variability addressed subjects sampled
Overall Quality Determination		High		

Study Citation:	Wallace, L., Pellizzari, E., Hartwell, T., Zelon, H., Sparacino, C., Perritt, R., Whitmore, R. (1986). Concentrations of 20 volatile organic compounds in the air and drinking water of 350 residents of New Jersey compared with concentrations in their exhaled breath. Journal of Occupational Medicine 28(8):603-608.		
HERO ID:	24793		
Conditions of Use:	use		
EXTRACTION			
Parameter	Data		
Exposure route:	Inhalation		
Personal sampling data:	Not detected in breath samples		
Area sampling data:	no information provided		
Comments:	Residents in New Jersey were selected; Occupations of the residents were never disclosed in the report.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High well described method
Domain 2: Representativeness	Metric 2:	Geographic Scope	High US data
	Metric 3:	Applicability	Uninformative The data appears to be for non-occupational scenario (general population exposure) that would not apply to any occupational scenario within scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low data greater than 20 years old
	Metric 5:	Sample Size	High Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low Monitoring data include sample type 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		Uninformative	

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:	commercial use			
EXTRACTION				
Parameter	Data			
Worker activity description:	painter			
Personal sampling data:	O-DCB concentrations (ug/m3) in 3 water-based paints are as follows: 1) water-based acrylic primer: mean - 1.9 ± 1.2, median - 1.5, max - 4.1. 2) water-based epoxy primer: mean - 1.8 ± 1.8, median - 1.4, max - 5.4. 3) water-based acrylic topcoat: mean - 1.7 ± 1.7, median - 0.9, max - 4.6.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	methodology is well described
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	not 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	High	data is less than 10 years
	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	High	addresses variability and uncertainty
Overall Quality Determination		High		

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:	Use			
EXTRACTION				
Parameter	Data			
Life cycle description:	Uncertain (vehicle use)			
Exposure route:	Inhalation			
Physical form:	Vapor			
Area sampling data:	23 samples. ND - 90.37 µg/m3			
Comments:	Interiors of 23 vehicles			
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is an approved NIOSH method.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data from the US
	Metric 3:	Applicability	Medium	Data is not for an in-scope use, but may be applicable for 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	Medium	Sample distribution characterized by limited statistics (min, max, mean) but discrete samples not provided and distribution not fully characterized.
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	Uncertainty is addressed in sampling/analytical methodology variability is addressed between car types
Overall Quality Determination			High	

Study Citation:	Fiserova-Bergerova, V., Pierce, J. T., Droz, P. O. (1990). Dermal absorption potential of industrial chemicals: Criteria for skin notation. American Journal of Industrial Medicine 17(5):617-635.			
HERO ID:	32206			
Conditions of Use:	All			
EXTRACTION				
Parameter	Data			
Exposure route:	dermal			
Physical form:	liquid			
Comments:	This data source contains absorption data for a number of 2019 start chemicals. There are also predictive models for dermal flux. Extraction of additional information from this source is needed. There are model parameters, predicted and experimental animal skin permeation data within the source and supporting discussions that may be useful for risk evaluation methodology development or improvement with respect to dermal exposure assessment.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Equations and choice of parameter values are appropriate for the model’s application.	
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 model can be appropriately applied to an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Medium	Model/source is more than 20 years old but the model parameters and the animal skin permeation data is not time-sensitive such the age of the source should play a role in the confidence of this source.	
Domain 3: Accessibility/ Clarity	Metric 5: Metadata Completeness	High	Model approach, equations, and choice of parameter values are transparent and clear and can be evaluated. Rationale for selection of approach, equations, and parameter values is provided.	
Domain 4: Variability and Uncertainty	Metric 6: Metadata Completeness	High	The model characterizes variability and uncertainty in the results.	
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:	Multiple		
EXTRACTION			
Parameter	Data		
Exposure route:	oral		
Physical form:	liquid, solid		
Dermal exposure data:	Oral Exposure Model: $E_{ii}=L_d \times SA \times TE$ (pdf pg. 2) TE were experimentally determined for liquid, solid, fine powder, rough powder, soluble powder, and insoluble powder(Table IV on pdf pg. 9).		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	The model is based on scientifically sound approaches, however, the model does not take into account evaporation or absorption. The experimentally determined TE's may be useful and the model may be adapted to account for those factors.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from the U.K., an OECD country.
	Metric 3: Applicability	High	Model can be applied to occupational scenarios where inadvertent oral exposure is likely.
	Metric 4: Temporal Representativeness	High	Data was published in 2014, so generally 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 and clear and can be evaluated. Rationale for selection of approach, equations, and parameter values is provided.
Domain 4: Variability and Uncertainty	Metric 6: Metadata Completeness	High	The model characterizes variability (e.g., study tests several different factors in varying transfer efficiencies) and uncertainty in the results (contains a limitation section).
Overall Quality Determination		High	

Study Citation:	NICNAS, (2001). Priority existing chemical assessment report no. 14: Ortho-dichlorobenzene.			
HERO ID:	5155563			
Conditions of Use:	Processing			
EXTRACTION				
Parameter	Data			
Worker activity description:	Blending, packaging			
Physical form:	Liquid, vapor			
Exposure duration:	"Blending: 0.25 - 4 hrs/day Packaging: 1 hr/day (max)" "Blending: 1 - 5 days/yr Packaging: 1-5 days/yr"			
Exposure frequency:	"Blending: 0.25 - 4 hrs/day Packaging: 1 hr/day (max)" "Blending: 1 - 5 days/yr Packaging: 1-5 days/yr"			
Number of workers:	"Blending: 1 -2 workers/company Packaging: 1 -2 workers/company"			
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 from Australia (OECD)	
	Metric 3: Applicability	Medium	Data are for foreign formulation, which may be applicable to domestic processing (in-scope)	
	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.	
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, (2011). Emission scenario document on coating application via spray-painting in the automotive refinishing industry.		
HERO ID:	3808976		
Conditions of Use:	Use - Automotive Coating Application		
EXTRACTION			
Parameter	Data		
Worker activity description:	transferring and mixing liquid products, container cleaning, transferring mixed coating to application equipment, overspray		
Exposure route:	dermal and inhalation		
Number of workers:	8 workers/site		
Personal protective equipment:	air-purifying respirators or air-supplied respirators, Gloves (typically latex or nitrile), paint suits, and face masks/eye protection		
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 multiple in-scope occupational scenarios; 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 limited statistics (min, max, 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	Medium	Uncertainty not addressed. Variability addressed by considering multiple coating types.
Overall Quality Determination		High	

Study Citation:	OECD, (2020). Emission scenario document on chemical additives used in automotive lubricants.			
HERO ID:	6385735			
Conditions of Use:	Processing and Use - Formulation and Use of Automotive Lubricants			
EXTRACTION				
Parameter	Data			
Worker activity description:	PROC: unloading, container cleaning, formulation, sampling, equipment cleaning, loading USE: Unloading, container cleaning			
Exposure route:	dermal and inhalation			
Exposure frequency:	Exposure Frequency: Processing: 203-360 days/yr Use: 253 days/yr			
Number of workers:	PROC: 22 workers/site USE: 4 workers/site			
Personal protective equipment:	PROC: Respirators, gloves, safety glasses USE: gloves, protective footwear, protective headwear, dust masks or respirators			
Engineering control:	LEV			
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 multiple in-scope occupational scenarios; 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	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 additive types.	
Overall Quality Determination		High		

Study Citation:	Science Applications International Corporation, (1996). Generic scenario for automobile spray coating: Draft report.
HERO ID:	6311222
Conditions of Use:	Automotive Coating Application

EXTRACTION	
Parameter	Data
Worker activity description:	"Auto OEM: robotics operations, paint mixing, paint booth cleaning, inspection, and manual ""touch-up"" paintingAutorefinish: wat sanding, car washing, stripping (paint removal), machine sanding, blowing, buffing, polishing, paint spraying, paint and primer mixing, and inspection"
Exposure route:	dermal and inhalation"dermal: Provides methods for modeling exposures to non-volatile liquids; Inhalation: Provides methods for modeling exposures to mists"
Personal sampling data:	inhalation: 8-hr TWA surrogate data
Exposure frequency:	"Auto OEM: 250 days/yrAutorefinish: 170 days/yr"
Number of workers:	"Auto OEM: 17 workers/siteAutorefinish: 4-10 workers/site"
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 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	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 OEM and refinish applications.

Overall Quality Determination	High
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Study Citation:	U.S. EPA, (2002). Flexographic ink options: A cleaner technologies substitutes assessment. Volume 1.			
HERO ID:	10293388			
Conditions of Use:	Use of flexographic inks			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation, dermal			
Physical form:	liquid, vapor			
Dermal exposure data:	Tables 3-F.1 and 3-F.2 in Appendix 3-F contain potential inhalation rates and maximum and minimum dermal exposure rates p. 154			
Number of workers:	p. 33over 80% of flexography companies employ fewer than 50 people			
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	The data are from the United States and are representative of the industry being evaluated.	
	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 ink types.	
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:	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
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
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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			
EXTRACTION				
Parameter	Data			
Worker activity description:	worker involved in repackaging operations (pg 35 of 116). As per pg 37 of 116, includes construction trade workers, and others as per Table 5-2			
Exposure route:	Potential routes of exposure (e.g., inhalation, dermal)Table 5-1 (pg 35 of 116) provides the exposure route for different activities. Exposure can be both inhalation and dermal.			
Physical form:	Physical form of the chemical(s) of interest for each exposure route (e.g., liquid, vapor, mist) and activity.			
Exposure duration:	Per the U.S. BLS website, operating duration for each NAICS code is assumed as a ‘year-round, full-time’ hours figure of 2,080 hours (U.S. BLS, 2020). Therefore, dividing this time by an assumed working duration of 8-12 hours/day yields TIMEoperating_days of 174-260 days/year. In the absence of chemical-specific data, EPA recommends assuming a shift length 8 hours/day as default estimate, which results in a default TIMEoperating_days of 260 days/yr (pg Table 5-3 provides the number of potentially exposed employees. total number of workers is 46,970.			
Number of workers:	Limited information was found regarding typical personal protective equipment (PPE) workers used during repackaging processes. One chemical wholesaler website indicated that commonly used PPE includes safety glasses, face shields, aprons, and gloves (CJB Industries, 2021). (pg 36 of 116)			
Personal protective equipment:	Engineering controls at another site include vacuum system and centrifugal degassing (pg 36 of 116)			
Engineering control:				
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
	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	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2021). Use of chemicals in fuels and related products - Generic scenario for estimating occupational exposures and environmental releases (Methodology review draft).			
HERO ID:	11203977			
Conditions of Use:	Use in Fuels and related Products			
EXTRACTION				
Parameter	Data			
Worker activity description:	Table 5-2 (pg 38 of 76) shows the worker activities			
Exposure route:	Table 5-1 (pg 36 of 76) shows the summary of occupational exposures. Include dermal exposure and inhalation exposure.			
Physical form:	Table 5-1 (pg 36 of 76) shows the summary of physical forms associated with activities			
Dermal exposure data:	Dermal exposure to liquid is expected for workers involved in operations at fueling stations (pg 40 of 76). To assess dermal exposure to volatile liquids during all activities, the Dermal Exposure to Volatile Liquids Model can be used (pg 41 of 76).			
Exposure duration:	Consistent with the Operating Hours, up to 8 hr/day (pg 49 of 76)			
Exposure frequency:	The number of days during which workers may be exposed is dependent on the frequency of worker activities. EPA did not find industry-specific information on the frequency of the worker activities discussed below. Generally, the number of exposure days is less than or equal to the number of operating days and can be estimated by multiplying the number of operating days (TIMEoperating_days) by the fraction of operating days during which there is worker exposure (F_exposure). In the absence of industry-specific information, EPA assumes that workers are potentially exposed up to 250 days/year. Because the default number of operating days is 365 days/yr (See Section 3.2), the default for (F_exposure) is 0.685 (= 250/365) day of exposure/day of operation. (pg 39 of 76)			
Number of workers:	70,286 (Table 5-3 on pg 39 of 76)			
Personal protective equipment:	Limited information was found regarding typical personal protective equipment (PPE) workers used during handling of fuels and related products (pg 37 of 76)			
Engineering control:	OSHA recommends that exposures to gasoline and diesel exhaust can be controlled by performing routine maintenance, installing engine filters, prohibiting idling, installing exhaust vents, and wearing respiratory protection (OSHA, 2012). (pg 37 of 76)			
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
	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	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized
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Study Citation:		U.S. EPA, (2021). Use of chemicals in fuels and related products - Generic scenario for estimating occupational exposures and environmental releases (Methodology review draft).		
HERO ID:		11203977		
Conditions of Use:		Use in Fuels and related Products		
Domain		Metric		EVALUATION
				Rating
Overall Quality Determination				High
				Comments

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:	Processing-plastic materials

EXTRACTION	
Parameter	Data
Worker activity description:	compounding of plastic resins.Occupational Exposures:A. Exposure to solid or liquids during unloading of additives from transport container andcharging additives to operation.B. Exposure to liquids during equipment cleaning of compounding equipment.C. Exposure to solids during filling containers with compounded plastic resin.
Exposure route:	inhalation and dermal
Physical form:	Solid, Liquid
Dermal exposure data:	A. Exposure from Unloading and Charging Additives to Compounding Process (Exposure A)Dermal: CEB standard estimate for routine direct handling of solids, 2 hands and incidental contact of liquids, 2 hands.Solid exposure:Dermal exposure = 3,100 mg/day x fraction of chemical in additive (if applicable)Example for solid additive:3,100 mg/day exposure = 3,100 mg/day x 1Liquid exposure:Dermal Exposure = liquid amount on skin x area of skin x # of incidents x fraction of chemical in additiveExample of liquid additive:1,800 mg/day exposure = 2.1 mg/cm2-incident x 840 cm2 x 1 incident/day x 1B. Exposure from Compounding Equipment Cleaning (Exposure B)Dermal: Assume manual equipment cleaning dermal model. CEB standard estimate for routine contact of liquids, 2 hands for equipment cleaning waste. Assume concentration of chemical in cleaning solution is 50% the concentration of chemical in resin (engineering judgment). Note, dermal contact with cooling water is not expected because of elevated temperatures.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 waterExample of antioxidant in resin at 0.005 weight fraction:4.4 mg/day exposure = 2.1 mg/cm2-incident x 840 cm2 x 1 incident/day x 1 x 0.005 x 0.5
Exposure duration:	8 hrs
Exposure frequency:	250 days per year
Number of workers:	25,557 workers in industry

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. EPA generic scenario document.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation. Not specific to oDCB.
	Metric 4:	Temporal Representativeness	Medium	more than 10 years but no 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	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions
Domain 4: Variability and Uncertainty				

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Occupational Exposure

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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:	Processing-plastic materials			
Domain		Metric	EVALUATION	
			Rating	Comments
	Metric 7:	Metadata Completeness	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2000). Leather dyeing - Generic scenario for estimating occupational exposures and environmental releases (draft).		
HERO ID:	6311220		
Conditions of Use:	Leather dyeing		
EXTRACTION			
Parameter	Data		
Worker activity description:	Worker activities include weighing, mixing, dyeing, drying, and buffing.		
Exposure route:	Dermal, Inhalation		
Physical form:	Liquid or solid		
Personal sampling data:	”Inhalation: Exposures estimated in weighing, mixing, and buffing; exposure during dyeing and drying considered negligible. Inhalation exposures based on dye concentration in mixture and concentration of mixture in air. Dermal: If a solid, estimated dermal exposure in mg/day from weighing the dye is 3,100*concentration of chemical. If a liquid, estimated dermal exposure in mg/day from mixing and filling operations is 1,800*concentration of chemical.”		
Exposure duration:	Exposure duration ranges between 1.5-8 hrs/day based on worker activity.		
Exposure frequency:	Calculation for days of operation		
Number of workers:	<7 workers exposed per site		
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	Low	Assessment is based on data greater than 20 years old.
	Metric 5: Sample Size	Medium	Sample distributions characterized by ranges/estimations and some state 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 both liquid and solid physical forms and different worker activities.
Overall Quality Determination		Medium	

Study Citation:	U.S. EPA, (2001). Manufacture and use of printing ink - Generic scenario for estimating occupational exposures and environmental releases (revised draft).			
HERO ID:	6311221			
Conditions of Use:	Industrial Use: Solvents (printing ink)			
EXTRACTION				
Parameter	Data			
Worker activity description:	”Inhalation exposure may result from unloading solid or volatile chemical substances used as ingredients for the ink” pg. 31/54”Dermal exposure may result from unloading additives, cleaning equipment, and packaging ink. Dermal estimates are based on CEB’s Method for Screening - Level Assessments of Dermal Exposure (CEB 2000).” pg. 32/54			
Exposure route:	dermal, inhalation (vapor or particulate is possible depending on product/process)			
Physical form:	liquid, vapor, solid			
Area sampling data:	”To estimate inhalation exposure to particulates, assume that the total particulate concentration in air is 2 mg/m3 . This was the average value found at the Consolidated Printing Inks site (NIOSH, 1981).” pg. 32/54			
Dermal exposure data:	pgs. 32-33/54 provide methods to assess dermal exposure(s)			
Exposure frequency:	Provides default value of 250 days/yr (pg. 31/54)			
Number of workers:	Table 6, pg. 30/54, provides number of workers by ink type			
Comments:	Note: This is not the most recent version of the Inks GS			
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 (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, 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	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The completed exposure or risk assessment is more 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	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	The assessment provides only limited discussion of the variability and uncertainty in the results.
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Study Citation:	U.S. EPA, (2001). Manufacture and use of printing ink - Generic scenario for estimating occupational exposures and environmental releases (revised draft).
HERO ID:	6311221
Conditions of Use:	Industrial Use: Solvents (printing ink)

Domain		Metric		EVALUATION	
				Rating	Comments
Overall Quality Determination				High	

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:	All			
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	N/A	N/A - only qualitative information 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		Medium		

Study Citation:	U.S. EPA, (1999). Flexographic printing - generic scenario for estimating occupational exposures and environmental releases: Draft.			
HERO ID:	6385709			
Conditions of Use:	Ink and Toners			
EXTRACTION				
Parameter	Data			
Worker activity description:	transferring and mixing inks, adjusting ink cans at the press, operating the press			
Exposure route:	dermal and inhalation			
Personal sampling data:	Provides methods for modeling exposures to volatile liquids			
Dermal exposure data:	Provides methods for modeling exposures to non-volatile liquids			
Exposure duration:	4-7.5 hrs/shift			
Exposure frequency:	300 days/yr			
Number of workers:	27 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	Low	Assessment is based on data greater than 20 years old.	
	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 worker activities.	
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2004). Spray coatings in the furniture industry - generic scenario for estimating occupational exposures and environmental releases: Draft.			
HERO ID:	6385719			
Conditions of Use:	Furniture Coating Application			
EXTRACTION				
Parameter	Data			
Worker activity description:	unloading, spray application, equipment cleaning			
Exposure route:	dermal and inhalation			
Personal sampling data:	inhalation: 8-hr TWA surrogate data			
Dermal exposure data:	”dermal: Provides methods for modeling exposures to non-volatile liquidsInhalation: Provides methods for modeling exposures to mists and volatile liquids”			
Exposure frequency:	250 days/yr			
Number of workers:	12-98 workers/site			
Personal protective equipment:	Air-supplied full face piece respirator; Disposable overalls and head covering; Gloves specific to the chemicals used; and boots and boot coverings			
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 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	Low	Assessment is based on data greater than 20 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples related to spray application 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 considering various chemical functions and wood vs metal furniture uses
Overall Quality Determination			High	

Study Citation:	York,, Wehran-New, Inc., (1990). Risk assessment for Buffalo Color area D.			
HERO ID:	1335671			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Number of sites:	1			
Exposure route:	Dermal, Inhalation			
Physical form:	liquid			
Area sampling data:	o-DCB was non-detect in the soil and air so dermal intake and inhalation exposure was not estimated			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Assessment performed by the submitting company. Data is expected to be accurate but there is potential for bias.
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 assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old. The assessment captures operations, equipment, and worker activities that are expected to be outdated.
	Metric 5:	Sample Size	Low	Uncertain sample size, but all samples were below the limit of detection
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	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination		Medium		

Study Citation:	Bender, H. F., Eisenbarth, P. (2007). Occupational safety and health at the workplace: Sections 6.1–6.8. :147-256.			
HERO ID:	7309849			
Conditions of Use:	Use as a processing aid			
EXTRACTION				
Parameter	Data			
Personal protective equipment:	pg 6 of 110: personal respiratory protective equipment (but not as a permanent measure); pg 39 of 110: PPE include respirators, protective gloves, and protective clothing			
Engineering control:	pg 24 of 110: control of potentially explosive atmospheres			
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	Medium	The data are from a non-OECD country	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope 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	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:	Bonner, E. M., Poutasse, C. M., Haddock, C. K., Poston, C., W.S., Jahnke, S. A., Tidwell, L. G., Anderson, K. A. (2024). Addressing the need for individual-level exposure monitoring for firefighters using silicone samplers.			
HERO ID:	12034026			
Conditions of Use:	Firefighting Activities			
EXTRACTION				
Parameter	Data			
Worker activity description:	Fire response, emergency response (firefighters). Despite structural firefighters wearing personal protective equipment(PPE) to mitigate these hazards, organic chemicals in smokeinfiltrate PPE and can be absorbed dermally, or inhaled when theself-contained breathing apparatus is removed. Even after afire is extinguished, firefighters are exposed to chemicals throughmultiple pathways, including off-gassing from the fireground andcross-contaminated gear, truck cabs, and fire stations (page 2 of 16)			
Exposure route:	Inhalation, dermal			
Number of workers:	Study consisted of 56 firefighters from two fire departments in the Kansas City metropolitan area.			
Personal protective equipment:	PDF Pg. 182Turnouts and hoods (GXTREME 3.0, Globe Manufacturing Company, LLC, Pittsfield, NH, USA; Quest Particle Barrier Hoods, Quest Fire Apparel Inc., Saratoga Springs, NY, USA)			
Comments:	No physical form given and no sample results given for o-dichlorobenzene. The LOD and LOQ of the sample method in pg/uL is 0.69 and 3.45 respectively (page 2 of 20 of the Supplement doc)			
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	Medium	Data are for firefighting, which may be similar or involve exposures associated with other OES such as the use of paints/coatings.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old. [2024]
	Metric 5:	Sample Size	N/A	N/A - no sample results presented.
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 - no sample results presented.
Overall Quality Determination		High		

Study Citation:	Burgess, W. A. (1991). Potential exposures in the manufacturing industry—Their recognition and control. :595-674.
HERO ID:	1267867
Conditions of Use:	commercial use - in degreasers and in paints and coatings

EXTRACTION	
Parameter	Data
Worker activity description:	Workers handling degreasers, paints and coatings
Exposure route:	Inhalation and dermal
Area sampling data:	In a review of solvent exposures in Danish manufacturing and service industries, a series of 72 air sampling measurements were conducted during spray painting. 38% of the mixed solvent exposures exceeded 0.25 of the ACGIH TLV TWA, 29% were between 0.25 and 1.0 of the ACGIH TLV-TWA and 33% exceeded the combined ACGIH TLV-TWA.
Particle size characterization:	The article reports the following: Basecoat and clearcoat application by conventional air atomizing manual and robotic systems operating at 200 to 1356 psig had a mass median aerodynamic diameter of 4 to 12 um depending on the air pressure. The clearcoat application by a rotary atomizer with rotational speeds of 17,000 to 40,000 rpm generated particles of 20 to 35 um. In another study, the mass median aerodynamic diameter of lacquer mist was characterized as 6.4 um with a standard deviation of 3.4; an enamel had a mass median aerodynamic diameter of 5.7 with a standard deviation of 2.0. In both cases, spray painting was conducted by conventional air atomization.
Number of workers:	Number of workers depends on the work referred in this article
Personal protective equipment:	Cold degreasing - Skin contact should be avoided and heavy duty protective gloves are mandatory. Glasses and a face shield should be used to protect the eyes and face from accidental splashing. Anyone entering a degreaser should wear a respirator suitable for conditions immediately dangerous to life or health; a lifeline should be held by an attendant.
Engineering control:	Cold degreasing - a work table with an exhaust is necessary for unloading and inspecting parts. In case of vapor degreaser, the controls are designed to minimize diffusion losses and disturbance losses due to rapid air movement across the top of the degreaser, movement of the load, convective velocities in the freeboard zone and overloading with subsequent vapor zone collapse. The controls are using a manual cover, using a freeboard ratio of 0.76 to 1.0, reducing condenser temperature, and reducing room draft. Other controls include periodic cleaning. Control measures for controlling fugitive emissions in paint mixing areas include using close fitting covers, equip tanks with integral agitators. All dispensing stations should be provided with collection trays and safety cans. Transfer of solvent should be done by closed-pump systems and not by open pouring. Controls in the application of two-component urethane and epoxy paint systems must include excellent housekeeping, effective ventilation control, and protective clothing; moreover, in applications not effectively controlled by ventilation, the operators should wear air-supplied respirators. Adequate washing facilities should be available, and eating, drinking, and smoking should be prohibited in the work area. A survey of 46 automobile shops involving 64 workers who did spray painting intermittently was conducted in Australia. Thirty percent of the shops used only an acrylic-based paint, 20% used only a polyurethane paint and the balance used both paint systems. Two-thirds of the shops had local exhaust control and the balance used general exhaust. Reusable, combination paint mist and vapor air-purifying respirators were available in all shops, however, approximately one-half of the workers used nuisance-type respirators. Airline respirators were available in one-tenth of the shops but used only occasionally. The air concentrations of solvent vapors were low with a mean concentration of one-fifth of the occupational exposure standard.

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data provided is from various countries (not restricted to US)
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The report is more than 20 years old.
	Metric 5:	Sample Size	Low	characterized by no statistics

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Study Citation:	Burgess, W. A. (1991). Potential exposures in the manufacturing industry—Their recognition and control. :595-674.		
HERO ID:	1267867		
Conditions of Use:	commercial use - in degreasers and in paints and coatings		
Domain		EVALUATION	
		Rating	Comments
Domain 3: Accessibility/ Clarity			
Metric 6:	Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		Medium	

Study Citation:	CDC, (2009). Fourth national report on human exposure to environmental chemicals.			
HERO ID:	664488			
Conditions of Use:	use			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation			
Physical form:	Vapor			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	report uses high 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 report is for an occupational scenario within the scope 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	characterized by no statistics	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	report clearly documents its data sources	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.	
Overall Quality Determination		High		

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:	Processing			
EXTRACTION				
Parameter	Data			
Life cycle description:	Processing as intermediate			
Worker activity description:	workers in Trichloroethylene and Anhydrous Hydrochloric Acid plants. Tested during plant shut down and during normal operation. Workers also cleared lines during monitoring.			
Exposure duration:	Exposure monitoring was conducted, but the information was marked as confidential and is not included in this source			
Personal protective equipment:	Full face respirators were used during short-term monitoring			
Comments:	Exposure monitoring was conducted, but the information was marked as confidential and is not included in this source			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality 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 from the U.S.
	Metric 3:	Applicability	High	In-scope use (organic chemical manufacturing)
	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	No samples for o-DCB
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source does not provide the results of monitoring, the data is omitted
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Uncertainty and variability not addressed
Overall Quality Determination		Medium		

Study Citation:	Heitbrink, W. (1993). In-depth survey report: Control technology for autobody repair and painting shops at Team Chevrolet, Colorado Springs, Colorado.			
HERO ID:	6558535			
Conditions of Use:	commercial use-spray painting prefilters			
EXTRACTION				
Parameter	Data			
Personal protective equipment:	Half-facepiece, air-purifying respirators that were equipped with organic vapor cartridges and spray painting prefilters			
Engineering control:	In the spray painting booth, a fan draws air through the filters in the door of the spray painting booth and through a second set of exhaust filters located in the back of the booth. The fan, which is located behind the booth, exhausts the air through louvers, which are located on the wall of the building. The paint booths use one fan to supply air to the booth and another fan to exhaust the booth. The air is supplied and exhausted through filters that are mounted in plenums. These filters are changed every four to five weeks. Before some painting jobs, the filters are wetted down with water. This probably reduces the air flow through these filters until the filters dry off.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	information provided is accurate	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	US data	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Low	The report is more than 20 years old.	
	Metric 5: Sample Size	N/A	N/A - information not dependent on samples	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	N/A	N/A - information not dependent on metada	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A - information not dependent on metada	
Overall Quality Determination		High		

Study Citation:	Heitbrink, W., Cooper, T., Edmonds, M., Bryant, C., Ruch, W. (1993). In-depth survey report: control technology for autobody repair and painting shops at Valley Paint and Body Shop, Amelia, Ohio.
HERO ID:	6558536
Conditions of Use:	Painting and Coating

EXTRACTION	
Parameter	Data
Personal protective equipment:	At this shop, the painters routinely wore rubber gloves while handling paints. Because the painters wore disposable clothing during spray painting, it is unlikely that work clothing is contaminated with toxic substances and that the painters need to take a shower and change clothing before returning home. Half-facepiece, air-purifying respirators that were equipped with organic vapor cartridges and spray painting prefilters were issued to all of the workers. This respirator was used for some primer painting, sanding, and welding.
Engineering control:	Because the spray painting booth and the vehicle preparation station do not completely control paint overspray, air-supplied hoods are used to control the worker's exposure to paint overspray. During the painting cycle, outside air is passed through a series of filters. The final set of filters cover the entire ceiling of the spray painting booth. A nominal 12,000 cubic feet per minute of air flows out of the ceiling around the car or object being painted and out of the booth through exhaust grates located in the floor of the booth.

		EVALUATION		
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1: Methodology	High	report uses high quality data	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	US data	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Low	The report is more than 20 years old.	
	Metric 5: Sample Size	N/A	N/A - information not dependent on samples	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	N/A	N/A - information not dependent on metadata	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A - information not dependent on metadata	

Overall Quality Determination	High
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Study Citation:	Mikatavage, M., Hee, Que, S. S., Ayer, H. E. (1984). Permeation of chlorinated aromatic compounds through Viton and nitrile glove materials. American Industrial Hygiene Association Journal 45(9):617-621.			
HERO ID:	1615876			
Conditions of Use:	Manufacturing, Processing, Use			
EXTRACTION				
Parameter	Data			
Physical form:	liquid			
Dermal exposure data:	Report tested different glove thicknesses and materials to assess how resilient they were to various chemicals by measuring breakthrough time.			
Exposure duration:	o-DCB: Sup. Nitrile: 20 +/- 5 min, Unsup. Nitrile: 37.5 +/- 7.5 min, Unsup. Viton: > 240 min. 150 sexamples, 50 for each glove type			
Personal protective equipment:	Gloves (butyl rubber, Viton)			
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 evalu-ated.
	Metric 3:	Applicability	Medium	Information on glove effectiveness would be applicable to any CoU where workers may wear gloves
	Metric 4:	Temporal Representativeness	Low	The report is more than 20 years old. The report captures operations, equipment, and worker activities that are expected to be outdated.
	Metric 5:	Sample Size	Low	Only average provided for 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	The report provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination		Medium		

Study Citation:	NIOSH, (2007). NIOSH pocket guide to chemical hazards.			
HERO ID:	192177			
Conditions of Use:	All			
EXTRACTION				
Parameter	Data			
Exposure route:	Inhalation, dermal, ocular (pg. 126/454)			
Physical form:	Colorless to pale-yellow liquid with a pleasant, aromatic odor. (pg. 126/454)			
Personal protective equipment:	Prevent skin and eye contact, also provides recommendations for respirator types and refers reader to Tables 3 and 4 for more info. (pg. 126/454)			
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 (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, 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	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 (applicable to all COU’s).
	Metric 4:	Temporal Representativeness	Medium	Reference was published in 2007
	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	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			High	

Study Citation:	NIOSH, (2018). NIOSH pocket guide to chemical hazards: o-Dichlorobenzene.		
HERO ID:	5353125		
Conditions of Use:	All		
EXTRACTION			
Parameter	Data		
Exposure route:	Inhalation, dermal, ocular		
Physical form:	Colorless to pale-yellow liquid with a pleasant, aromatic odor		
Personal protective equipment:	Respirator RecommendationsNIOSH/OSHAUp to 200 ppm:(APF = 50) Any chemical cartridge respirator with a full facepiece and organic vapor cartridge(s)(APF = 25) Any powered, air-purifying respirator with organic vapor cartridge(s)(APF = 50) Any self-contained breathing apparatus with a full facepiece(APF = 50) Any supplied-air respirator with a full facepieceEmergency or planned entry into unknown concentrations or IDLH conditions:(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand orother positive-pressure mode(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or otherpositive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatusEscape:(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vaporcanisterAny appropriate escape-type, self-contained breathing apparatus		
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 (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, 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	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 (applicable to all COU's).
	Metric 4: Temporal Representativeness	High	Data was obtained from NIOSH within the last 10 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	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

Study Citation:	NIOSH, (1978). Occupational health guideline for o-dichlorobenzene.			
HERO ID:	8409371			
Conditions of Use:	General use of oDCB			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation, contact with eyes or skin, or ingestion			
Physical form:	liquid, vapor			
Personal protective equipment:	impervious gloves, face shields, splash proof goggles			
Engineering control:	General dilution ventillation, PPE			
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 (US Department of Health and Human Services) 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	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Low	The report is more than 20 years old. The report captures operations, equipment, and worker activities that are expected to be outdated.	
	Metric 5: Sample Size	N/A	N/A - Data not based on sampling	
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:	NLM, (n.d.). Hazardous agents: o-Dichlorobenzene.			
HERO ID:	10143102			
Conditions of Use:	Solvents			
EXTRACTION				
Parameter	Data			
Worker activity description:	Pg. 2 states that "Metal Degreasing" and "Painting (solvents)" as "Industrial Processes with risk of exposure"			
Exposure route:	inhalation and dermal			
Physical form:	Colorless to pale-yellow liquid with a pleasant, aromatic odor.(herbicide); [NIOSH]. pg. 1			
Comments:	Solvents is what is listed as "Major Category" on pg. 1			
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 (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, 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	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	High	Data was accessed within the last 10 years	
	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 report does not address variability or uncertainty.	
Overall Quality Determination		High		

Study Citation:	Stull, J. O., Herring, B. (1990). Selection and testing of a glove combination for use with the USA coast Guard’s chemical response suit. American Industrial Hygiene Association Journal 51(7):378-383.		
HERO ID:	659704		
Conditions of Use:	Manufacturing, Processing, Use		
EXTRACTION			
Parameter	Data		
Exposure route:	dermal		
Physical form:	liquid		
Dermal exposure data:	Report tested different combinations of dual glove systems to assess how resilient they were to various chemicals by measuring breakthrough time. O-DCB did not break through any of the gloves tested. 3 hr breakthrough tests		
Exposure duration:	3 hrs		
Personal protective equipment:	Gloves (butyl rubber, Viton, and Silvershield);		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Methods are well documented (ASTM F739-85) and assumed to be accurate.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data from US
	Metric 3: Applicability	Medium	Information on glove effectiveness would be applicable to any CoU where workers may wear gloves
	Metric 4: Temporal Representativeness	Low	Report is based on data greater than 20 years old.
	Metric 5: Sample Size	High	Sampling was done in triplicate,
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Methods and assumptions are clearly described
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability discussed between glove types but not uncertainty.
Overall Quality Determination		High	

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:	Used to develop a method to estimate number of sites and workers.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	BLS is expected to use reliable survey methods.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	U.S. based economic data
	Metric 3:	Applicability	High	These economic data cover all industry and occupation types in scope for all chemicals.
	Metric 4:	Temporal Representativeness	High	The BLS OES data are from 2021
	Metric 5:	Sample Size	High	The BLS OES program provides detailed statistics and estimated relative standard error for each state, industry, and occupation survey conducted (https://www.bls.gov/oes/current/oes_research_estimates.htm).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	BLS documents results and methods, but underlying survey results not accessible.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Limited discussion of variability and uncertainty in results.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2020). 2020 CDR: Commercial and consumer use.			
HERO ID:	10366189			
Conditions of Use:	Import			
EXTRACTION				
Parameter	Data			
Number of workers:	Provides range of workers.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	EPA is a trusted source.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	CDR is U.S. based data.	
	Metric 3: Applicability	High	CDR covers chemical importers, which is in scope for o-DCB	
	Metric 4: Temporal Representativeness	High	EPA used data from the 2020 CDR, which includes data reported for 2020	
	Metric 5: Sample Size	Medium	Due to reporting threshold, statistical representativeness is unclear.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Submissions do not include method of how production volumes were determined. CDR industry sector codes, industrial processing and use codes, industrial function codes, and commercial product codes provide good metadata; but lack of clarifying information and narratives and occasional misreportings limit clarity of data.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	CDR data do not address variability or uncertainty in submitter provided data.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2020). 2020 CDR: Commercial and consumer use.			
HERO ID:	10366189			
Conditions of Use:	Commercial-Solvent			
EXTRACTION				
Parameter	Data			
Number of workers:	Paints and Coatings: < 10Ink, Toner, and Colorant Products: 100 – 499			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	EPA is a trusted source.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	CDR is U.S. based data.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	EPA used data from the 2020 CDR, which includes data reported for 2020.
	Metric 5:	Sample Size	Medium	Due to reporting threshold, statistical representativeness is unclear.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Submissions do not include method of how production volumes were determined. CDR industry sector codes, industrial processing and use codes, industrial function codes, and commercial product codes provide good metadata; but lack of clarifying information and narratives and occasional misreportings limit clarity of data.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	CDR data do not address variability or uncertainty in submitter provided data.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2026). Chemical Data Reporting (CDR): Reporting year 2024.				
HERO ID:	13246149				
Conditions of Use:	Manufacture, Import, Processing as a reactant, Use of laboratory chemicals, Plastics Compounding, and Industrial use of solvents				
EXTRACTION					
Parameter	Data				
Physical form:	Provides physical form for multiple OES.				
Number of workers:	Provides number of workers for multiple OES.				
EVALUATION					
Domain	Metric	Rating	Comments		
Domain 1: Reliability	Metric 1: Methodology	High	EPA is a trusted source.		
Domain 2: Representativeness	Metric 2: Geographic Scope	High	CDR is U.S. based data.		
	Metric 3: Applicability	High	CDR covers multiple OES, which are in scope for the chemical.		
	Metric 4: Temporal Representativeness	High	EPA used data from the 2024 CDR.		
	Metric 5: Sample Size	Medium	Number of workers is presented as a range.		
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	CDR industry sector codes, industrial processing and use codes, industrial function codes, and commercial product codes provide good metadata; but lack of clarifying information and narratives and occasional misreportings limit clarity of data.		
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	CDR data do not address variability or uncertainty in submitter provided data.		
Overall Quality Determination		High			

Study Citation:	U.S. EPA, (2020). 2020 CDR data.			
HERO ID:	6275311			
Conditions of Use:	Manufacture and Import			
EXTRACTION				
Parameter	Data			
Physical form:	Provides physical form.			
Number of workers:	Provides number of workers.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	EPA is a trusted source.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	CDR is U.S. based data.	
	Metric 3: Applicability	High	CDR covers chemical manufacturers and importers, which are in scope for all chemicals. Also, downstream industrial use categories are specified, which include multiple relevant OESs.	
	Metric 4: Temporal Representativeness	High	EPA used data from the 2020 CDR, which includes data reported for 2019.	
	Metric 5: Sample Size	Medium	Due to reporting threshold, statistical representativeness is unclear.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Submissions do not include method of how production volumes were determined. CDR industry sector codes, industrial processing and use codes, industrial function codes, and commercial product codes provide good metadata; but lack of clarifying information and narratives and occasional misreportings limit clarity of data.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	CDR data do not address variability or uncertainty in submitter provided data.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2010). Manufacture and use of printing inks - generic scenario for estimating occupational exposures and environmental releases: Draft.			
HERO ID:	6385710			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Worker activity description:	A. Dermal exposure solid raw materials and inhalation exposure to particulateB. Dermal exposure to liquid raw materials and inhalation exposure to volatile materialsC. Inhalation exposure to fugitive air emissions from dispersion tankD. Inhalation exposure to fugitive air emissions from millingE. Dermal and inhalation exposure during equipment cleaningF. Dermal exposure to ink during loading and inhalation exposure from volatile components			
Exposure route:	inhalation, Dermal			
Physical form:	paste, liquid, or solid			
Number of workers:	7,432 production workers			
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. EPA generic scenario document
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States
	Metric 3:	Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation. Not Specific to oDCB
	Metric 4:	Temporal Representativeness	Medium	The report is generally 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	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination		High		

Occupational Exposure

Study Citation:	U.S. EPA, (2010). Manufacture and use of printing inks - generic scenario for estimating occupational exposures and environmental releases: Draft.			
HERO ID:	6385710			
Conditions of Use:	Industrial use- Printing Operations			
EXTRACTION				
Parameter	Data			
Worker activity description:	A. Dermal exposure to ink and inhalation exposure to volatile components during unloadingB. Inhalation exposure to fugitive air releases from ink reservoirC. Inhalation exposure to ink mist generated from printing pressD. Dermal and inhalation exposure during equipment cleaningE. Inhalation exposure to fugitive air releases from drying			
Exposure route:	inhalation, Dermal			
Physical form:	paste, liquid, or solid			
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. EPA generic scenario document
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States
	Metric 3:	Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation. Not Specific to oDCB
	Metric 4:	Temporal Representativeness	Medium	The report is generally more than 10 years but no 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	High	Assessment or report clearly documents its data sources, assessment methods, results, 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:	U.S. EPA, (1991). Granular detergents manufacture - generic scenario for estimating occupational exposures environmental releases: Draft.			
HERO ID:	6385740			
Conditions of Use:	cleaning and washing agent			
EXTRACTION				
Parameter	Data			
Worker activity description:	handling bags, connecting feed hose, sampling mixtures, equipment leaks, handling fines from dust collectors/cyclone, cleaning spray dryer, dumping fines back into system, packing, maintenance work			
Exposure route:	dermal and inhalation			
Physical form:	powder			
Area sampling data:	Inhalation: Provides methods for modeling exposures to volatile liquids and solids			
Dermal exposure data:	dermal: Provides methods for modeling exposures to non-volatile liquids and solids			
Exposure duration:	no information available			
Exposure frequency:	250 days/yr			
Number of workers:	3 material handlers/site3 wet-end operators/site3 dry-end operators/site6-9 packers/site3-6 maintenance 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	Low	Assessment is based on data greater than 20 years old.
	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 is addressed by considering multiple job types.
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 treatment plant			
Release or emission factors:	Concentrations of o-DCB: wastewater - <0.2 ug/L; landfill run-off - <0.2 ug/L			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	methodology is well described
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
	Metric 4:	Temporal Representativeness	High	no more than 10 years old
	Metric 5:	Sample Size	Low	characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Data include sample type 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		Medium		

Study Citation:	ATSDR, (2006). Toxicological profile for dichlorobenzenes.			
HERO ID:	5160103			
Conditions of Use:	Processing (unspecified)			
EXTRACTION				
Parameter	Data			
Release quantity:	According to the TRI, in 2003, a total of 92,973 pounds (42 metric tons) of 1,2-DCB was released to the environment from 39 large processing facilities. Of this total release estimate, an estimated 87,443 pounds (40 metric tons) were released to air,1,240 pounds (0.6 metric tons) were released to water, 1,784 pounds (0.8 metric tons) were released to land, and 2,500 pounds (1 metric ton) were released via underground injection. The total amount of1,2-DCB released on-site was estimated as 91,868 pounds (42 metric tons). The total amount releasedoff-site was estimated as 1,104 pounds (0.5 metric tons) (TRI03 2005).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The release data methodology is known or expected to be accurate and is known to cover all release sources at the site (TRI 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	Medium	The release 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	Medium	Data collected from 2005 (more than 10 years old)
	Metric 5:	Sample Size	N/A	N/A - release estimates not based on sample collection
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	Medium	The release data study provides only limited discussion of the variability in thedeterminants of release. The release data study provides only limited discussion of theuncertainty in the release results
Overall Quality Determination		Medium		

Study Citation:	ATSDR, (2006). Toxicological profile for dichlorobenzenes.			
HERO ID:	5160103			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter		Data		
Release or emission factors:		1-2 DCB emissions of a municipal waste incineration plant were 2.32x10-6 ppm. DCBs were detected in emissions from municipal solid waste composting facilities at concentrations of 1.16x10-4 ppm for 1,2-DCB. 1,2-DCB was detected in landfill gas at the Fresh Kills municipal solid waste landfill in New York City with a mean concentration of 2.17 ppm		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The release data methodology is known or expected to be accurate and is known to cover all release sources at the site (TRI 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	Medium	The release 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	Medium	Data collected from 2005 (more than 10 years old)
	Metric 5:	Sample Size	N/A	N/A - release estimates not based on sample collection
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	Medium	The release data study provides only limited discussion of the variability in thedeterminants of release. The release data study provides only limited discussion of theuncertainty in the release results
Overall Quality Determination			Medium	

Study Citation:	Brown, S. L., Chan, F. Y., Jones, J. L., Liu, D. H., Mccaleb, K. E. (1975). Research program on hazard priority ranking of manufactured chemicals (Chemicals 21-40).			
HERO ID:	5251828			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Release quantity:	0.9 million lbs/yr released from manufacturing - pg 165 in 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 US
	Metric 3:	Applicability	High	Report discusses o-DCB manufacturing (in-scope)
	Metric 4:	Temporal Representativeness	Low	Data are greater 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	Sample distribution is characterized by no statistics.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Low		

Study Citation:	CEPE, (2020). SpERC fact sheet: Industrial application of coatings by spraying.			
HERO ID:	10442901			
Conditions of Use:	Paints and coatings			
EXTRACTION				
Parameter	Data			
Description of release source:	Industrial application of coatings by spraying			
Release or emission factors:	Spraying, indoor, incineration, volatilesAir Release Factor: 20.8%Water Release Factor: 0%Soil Release Factor: 0%Waste Release Factor: 5%Spraying, indoor, volatilesAir Release Factor: 95%Water Release Factor: 0%Soil Release Factor: 0%Waste Release Factor: 5%Spraying, indoor, non-volatilesAir Release Factor: 1.5%Water Release Factor: 0%Soil Release Factor: 0%Waste Release Factor: 10-52%Spraying, indoor, powderAir Release Factor: 2%Water Release Factor: 1%Soil Release Factor: 0%Waste Release Factor: 3-30%			
Release frequency:	225 days/year			
Waste treatment methods and pollution control:	Incineration			
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	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation but data is general and not chemical specific.
	Metric 4:	Temporal Representativeness	High	Fact sheet is from 2020.
	Metric 5:	Sample Size	Low	characterized by no statistics.
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.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability is addressed by including emission factors for different processes, but uncertainty is not addressed.
Overall Quality Determination		Medium		

Study Citation: CEPE, (2020). SpERC fact sheet: Professional application of coatings and inks by spraying.
HERO ID: 10442902
Conditions of Use: Paints and coatings, Ink, toner, and colorant products

EXTRACTION

Parameter	Data
Description of release source:	Professional application of coatings and inks by spraying
Release or emission factors:	Spraying, indoor, volatilesAir Release Factor: 97%Water Release Factor: 0%Soil Release Factor: 0%Waste Release Factor: 3%Spraying, indoor, non-volatilesAir Release Factor: 0%Water Release Factor: 0%Soil Release Factor: 0%Waste Release Factor: 10-60%Spraying, outdoor, volatilesAir Release Factor: 98%Water Release Factor: 2%Soil Release Factor: 0%Waste Release Factor: 0%Spraying, outdoor, non-volatilesAir Release Factor: 0%Water Release Factor: 2%Soil Release Factor: 2%Waste Release Factor: 9-30%
Release frequency:	Indoor: 365 days/yrOutdoor: 225 days/yr
Waste treatment methods and pollution control:	Incineration, sewage treatment plant

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	The data are from an OECD country other than the U.S.
	Metric 3: Applicability	Medium	The report is for occupational scenarios within the scope of the risk evaluation but data is general and not specific to the chemical.
	Metric 4: Temporal Representativeness	High	Fact sheet is from 2020.
	Metric 5: Sample Size	Low	characterized by no statistics.
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.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability is addressed by including emission factors for different processes, but uncertainty is 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:	"Reasonable worst-case HWI stack emissions: 95 ng/L 0.83 tons/yr" 753 kg/yr			
Release or emission factors:	reported releases by HWI's			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Sources for release data are trustworthy. EPA report.
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	Data for in scope use
	Metric 4:	Temporal Representativeness	Low	Data from 1990, older than 20 years
	Metric 5:	Sample Size	N/A	N/A - information not dependent on samples
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Metadata given, but release frequency not provided
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability between different incinerator types is discussed, but no discussion of uncertainty
Overall Quality Determination			High	

Study Citation:	Deng, Y., Bonilla, M., Ren, H., Zhang, Y. (2018). Health risk assessment of reclaimed wastewater: A case study of a conventional water reclamation plant in Nanjing, China. Environment International 112:235-242.
HERO ID:	4728647
Conditions of Use:	Disposal

EXTRACTION

Parameter	Data
Description of release source:	A water reclamation plant in Nanjing, China.
Release or emission factors:	Concentrations of o-DCB from reclaimed wastewater treatment units are: oxidation ditch – 44 +/- 8.9, coagulation tank – 34 +/- 6, biological aerated filter – 35 +/- 7.5, and ultraviolet disinfection pool – 250 +/- 42.
Waste treatment methods and pollution control:	Treatment units in the wastewater reclamation plant include oxidation ditch, coagulation tank, biological aerated filter, and ultraviolet disinfection pool.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	report uses high quality data
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	The data are from a non-OECD country
	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	High	Statistical distribution of samples is fully characterized
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.

Overall Quality Determination**High**

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
Description of release source:	The Sasol Chemicals plant in Westlake, Louisiana, a source of 1,3-butadiene releases, was the site of an explosion in January 2020. A 2016 EPA inspection of Firestone Polymers in Sulphur, Louisiana found that it was releasing illegal amounts of 1,3-butadiene. In 2017, an equipment failure caused the Firestone Polymers plant to release an estimated 740 pounds of 1,3-butadiene per day. Since 2015, there have been 32 accidental releases of 1,3-butadiene at the Shell Chemical plant in Norco, Louisiana (St. Charles Parish).The TX/LA Gulf region experiences more than one-half the releases of the chemical in the entire United States: ; 1,3-butadiene (73.6 percent of all U.S. releases). In addition, this region experiences more than 70 percent of the incoming waste transfers of the chemical in the United States: 1,3-butadiene (75.4 percent of all U.S. incoming waste transfers).
Release quantity:	Releases & Transfers of High Priority Chemicals (Port Arthur, TX Area) 2012-2018 (lbs): Air - 2,885,991.2; Water - 293.4; Total releases - 2,886,284.6; Offsite transfer - 181,092.6; Incoming waste transfer - 6,301,871.4; Percent of nationwide total releases - 28.962%; Percent nationwide total offsite transfer - 0.611%; Percent nationwide total incoming waste transfer - 20.752%Releases & Transfers of High Priority Chemicals (Houston, TX Area) 2012-2018 (lbs): Air - 3,895,577.20; Water - 59.48; Total releases - 3,895,636.68; Offsite transfer - 445,862.75; Incoming waste transfer - 16,606,166.25; Percent of nationwide total releases - 39.091%; Percent nationwide total offsite transfer - 1.504%; Percent nationwide total incoming waste transfer - 54.685%Releases & Transfers of High Priority Chemicals (Mossville, LA Area) 2012-2018 (lbs): Air - 560,487.02; Water - 301.44; Land - 130.00; Total releases - 560,918.46; Offsite transfer - 22,246,217.00; Incoming waste transfer - 8,356.00; Percent of nationwide total releases - 5.629%; Percent nationwide total offsite transfer - 75.035%; Percent nationwide total incoming waste transfer - 0.028%Releases & Transfers of High Priority Chemicals in Cancer Alley, 2012-2018 (lbs): Air - 1,225,797.56; Water - 304.00; Land - 130.00; Total releases - 680,414.56; Offsite transfer - 3,970,186.94; Incoming waste transfer - 3,920,312.77 ; Percent of nationwide total releases - 6.828% ; Percent nationwide total offsite transfer - 13.391%; Percent nationwide total incoming waste transfer - 12.910%
Release or emission factors:	See Release Quantity

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The release data methodology is expected to be accurate and cover all pertinent release sources.
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	High	Data from past 10 years.
	Metric 5: Sample Size	High	Individual release data provided.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty			

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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		
Domain		Metric	EVALUATION	
			Rating	Comments
Metric 7:		Metadata Completeness	Medium	Variability is accounted for through investigation of various high throughput regions. However, uncertainty of releases is not addressed.
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:	disposal

EXTRACTION

Parameter	Data
Release quantity:	Soil sampling results are as follows – maximum concentrations detected are shown: fire training burn pit –200 ppb; test site 3 – ND; test site 2 – 80 ppb; temporary drum storage area – 8 ppb; remote test site – 80 ppb; salvage yard – 40 ppb; engine cleaning pits area – 20 ppb; former drum storage area – 2500 ppb; Bldg 32 surface runoff area – ND; storm drainage discharge site – ND; Bldg 12 backfilled clarifiers and test sump – ND; Bldg 15 utility trenches and clarifier – 20 ppb; Bldg 14 clarifiers – ND; liquid waste neutralization pit – ND; oil and grease pit area – ND; Bldg 35 sumps – ND; underground tank south of Bldg 5 – 100 ppb. Groundwater sampling results are as follows – maximum concentrations detected are shown: fire training burn pit –300 ppb; west storage and test area – 0.6 ppb; salvage yard – 1 ppb; Bldg 15 utility trenches and clarifier – 5 ppb; Bldg 12 backfilled clarifiers and test sump – 2 ppb; storm drainage discharge site – 10 ppb; underground tanks north of Bldg 12 – 0.9 ppb; underground tanks west of Bldg 11 – 0.9 ppb; underground tank south of Bldg 5 – 9 ppb.
Waste treatment methods and pollution control:	Soil remediation at the site include removal of soils containing chemicals in excess of hazardous waste criteria and TPH at concentrations greater than 100 ppm. Groundwater remediation system included six groundwater extraction wells and a water treatment plant that included two countercurrent air stripping towers and vapor phase carbon treatment units.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Used EPA approved methods for sampling
Domain 2: Representativeness	Metric 2: Geographic Scope	High	US data
	Metric 3: Applicability	Low	The data are for a non-occupational scenario that is similar to 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	Low	No statistics presented
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 monitoring study does not address variability or uncertainty.

Overall Quality Determination**Medium**

Study Citation:	Eklund, B., Anderson, E. P., Walker, B. L., Burrows, D. B. (1998). Characterization of landfill gas composition at the Fresh Kills municipal solid-waste landfill. Environmental Science & Technology 32(15):2233-2237.			
HERO ID:	1487387			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	disposal in landfill			
Release quantity:	Measured 2.17 ppmv o-DCB in landfill gas			
Release or emission factors:	rce across a landfill and within a given emission source? Emission sources include passive vents, soil surfaces, and gas collection systems.			
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	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	Data for in scope use
	Metric 4:	Temporal Representativeness	Low	Data from 1998 (>20 years old)
	Metric 5:	Sample Size	Low	Over 250 gas samples taken but only the average was given
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			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

EXTRACTION

Parameter	Data
Description of release source:	Cement kiln incineration
Release quantity:	Contains stack emission estimates for releases from burning hazardous waste in a cement kiln. O-DCB was not detected
Waste treatment methods and pollution control:	Incineration in a cement kiln
Comments:	CARB methods

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Release data methodology is from well-documented sources and expected to be accurate
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	Low	Disposal is an in-scope CoU, but no data for o-DCB is contained in the source
	Metric 4: Temporal Representativeness	Low	Data from 1980-1984, older than 20 years
	Metric 5: Sample Size	High	Raw sample data was provided
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment clearly documents its methods and results
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:	Herrmann, J. M. (2017). Photocatalysis.
HERO ID:	10186802
Conditions of Use:	Disposal

EXTRACTION

Parameter	Data
Description of release source:	Generally described as "aqueous waste streams" throughout the report
Waste treatment methods and pollution control:	Table 2, pg. 17/44, lists 1,2-dichlorobenzene as an "aqueous pollutant eliminated and mineralized by photocatalysis"

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	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	Data seems to generally be between 10 and 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	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**Medium**

Study Citation:	IARC, (1982). IARC monographs on the evaluation of the carcinogenic risk of chemicals to humans: Some industrial chemicals and dyestuffs. IARC monographs on the evaluation of carcinogenic risks to humans 29:1-398.
HERO ID:	27010
Conditions of Use:	Manufacturing

EXTRACTION	
Parameter	Data
Description of release source:	scrubbing and venting washes
Release quantity:	The combination of venting and scrubbing washings during ortho-dichlorobenzene manufacture reportedly contributed 405 thousand kg to the US environment in 1972; 2000 kg of orthodichlorobenzene were released into the air in 1977 by venting during its use in the US as a process solvent in the manufacture of toluene diisocyanates; 2.18 million kg ortho-dichlorobenzene were estimated to have been released to water as a result of its use as a process solvent in the production of toluene diisocyanates;
Release or emission factors:	5-10% of annual US PV released to air

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Methodology not described, however the data is from the EPA so it is assumed to be reliable
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US data
	Metric 3:	Applicability	High	Data for manufacturing, processing, and use which are in-scope CoU
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5:	Sample Size	Low	Overall releases for industry sectors, statistics from site-specific releases not characterized
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Includes release media only, no other metadata
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.

Overall Quality Determination

Medium

Study Citation:	IARC, (1982). IARC monographs on the evaluation of the carcinogenic risk of chemicals to humans: Some industrial chemicals and dyestuffs. IARC monographs on the evaluation of carcinogenic risks to humans 29:1-398.			
HERO ID:	27010			
Conditions of Use:	Processing			
EXTRACTION				
Parameter	Data			
Life cycle description:	Processing as a reactant			
Description of release source:	scrubbing and venting washes			
Release quantity:	An estimated 5-10% of the annual US production of ortho-dichlorobenzene has been reported to be released into the air. Johnston et al. (1979) estimated that 2000 kg of orthodichlorobenzene were released into the air in 1977 by venting during its use in the US as a process solvent in the manufacture of toluene diisocyanates. During 1977, as much as 2.18 million kg ortho-dichlorobenzene were estimated to have been released to water as a result of its use as a process solvent in the production of toluene diisocyanates			
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 processing as a reactant, 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	Includes release media only, no other metadata
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	IARC, (1982). Ortho- and para-dichlorobenzenes. IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans, vol. 29:213-238.
HERO ID:	4912310
Conditions of Use:	Manufacturing

EXTRACTION	
Parameter	Data
Release quantity:	In 1978, air samples taken five miles from a waste disposal site in New Jersey were found to contain 0-10 µg/m3 [0-2 ppb] ortho-dichlorobenzene and 0-0.5 µg/m3 [0-0.08 ppb] para-dichlorobenzene. At the site of a New Jersey chemical plant, ortho-dichlorobenzene was detected in air at a level of 1.3 µg/m3 [0.22 ppb]. Air samples in Birmingham, Alabama, were found to contain 0.35 µg/m3 [0.06 ppb] ortho-dichlorobenzene; and an industrial cloud over Henderson, Nevada, reportedly contained a total of 1.6-33 µg/m3 [0.3-5.5 ppb] dichlorobenzene isomers, in comparison with 0.6-5 µg/m3 [0-1.1 ppb] in nearby Las Vegas (US Environmental Protection Agency, 1980c). Air samples taken in five cities in New Jersey in 1978 were found to contain low average concentrations of ortho- and para-dichlorobenzenes: the highest were found in Newark - 1.0 ppb [6 µg/m3] ortho-dichlorobenzene and 0.66 ppb [3.96 µg/m3] para-dichlorobenzene; in Rutherford, New Jersey, concentrations of the ortho isomer averaged 0.08 ppb [0.48 µg/m3] in a residential area and 0.48 ppb [2.9 µg/m3] in an industrial area; and corresponding values for the para isomer were 0.1 ppb [0.6 µg/m3] and 0.41 ppb [2.4 µg/m3] (Bozzelli and Kebbekus, 1979). Levels of ortho-dichlorobenzene found in aerial fallout samples taken in 1977 along the southern California coast were less than 53 ng/m2 (US Environmental Protection Agency, 1980d).

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Data from reliable sources (U.S. international trade commission, department of commerce)
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	Medium	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. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	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 with multiple years PV data and uncertainty not addressed

Overall Quality Determination	High
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Study Citation:	IARC, (1999). Some chemicals that cause tumours of the kidney or urinary bladder in rodents and some other substances.			
HERO ID:	666726			
Conditions of Use:	Uncertain			
EXTRACTION				
Parameter	Data			
Description of release source:	air, water, land			
Release quantity:	”Emissions of ortho-dichlorobenzene to the air from 33 industrial facilities in the United States were 111 000 kg in 1994. The major sources of ortho-dichlorobenzene in the atmosphere have been reported to be solvent applications, which may account for 25% of annual releases to the atmospher According to the National Library of Medicine (1998) Toxic Chemicals Release Inventory, in 1994 1277 kg of ortho-dichlorobenzene were released to surface waters from 33 facilities in the United States In 1994, industrial releases of ortho-dichlorobenzene to the land from 33 facilities in the United States amounted to 11 000 kg”			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The release data methodology is known or expected to be accurate and is known to cover all release sources at the site.
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	Source is not specific on conditions of use, but states that roughly 25% of emissions to air are from solvent use
	Metric 4:	Temporal Representativeness	Low	The data were collected before the most recent federal regulatory action or update or are more than 20 years old if no federal regulation is established. The operations, equipment, and worker activities are not available or indicate that the associated data are expected to be outdated.
	Metric 5:	Sample Size	Low	Source only provides estimated emissions, no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Only provides release data, no metadata provided
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:	IPCS, (1991). Chlorobenzenes other than hexachlorobenzene.			
HERO ID:	81628			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Release quantity:	Losses during manufacturing: 1.1-2.1 x 10^5 kg (1983) Losses to environment: 30 x 10^3 kg (1983)			
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 for manufacturing, an in scope use
	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			Medium	

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:	"In a laboratory study where distilled water containing an average of 151 microgram/L 1,2-dichlorobenzene was passed through a diffused-air aerator, the Drinking Water Research Division found a 74 percent reduction in the average concentrations at a 15:1 air-to-water ratio. Other aeration conditions and corresponding percent removals are shown in Section 4, Figure 26." Pg. 74/120Table 15, pg. 93/120, provides percent removed by boilingFigure 20, pg. 74/120, provides Isotherms for Dichlorobenzene Adsorption on Activated Carbon.

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	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	Medium	The data is for drinking water purification but could be relevant for waste treatment methods
	Metric 4:	Temporal Representativeness	Low	Data is over 20 years old.
	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	Low	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. The release data study provides only limited discussion of the uncertainty in the release results.

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:	Various Industries			
EXTRACTION				
Parameter	Data			
Release quantity:	Table 10 shows that 0 kg of o-DCB were the estimated release quantities for a variety of industries(Chemical Industry, pharmaceutical industry, dye industry, textile industry, rubber industry, leather industry, paper industry, formulating industry)			
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 from Netherlands (OECD)	
	Metric 3: Applicability	High	Contains data for the chemical industry, which is 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	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		Low		

Study Citation:	Macleod, M., Mackay, D. (1999). An assessment of the environmental fate and exposure of benzene and the chlorobenzenes in Canada. Chemosphere 38(8):1777-1796.			
HERO ID:	660263			
Conditions of Use:	Manufacturing, Process, Use			
EXTRACTION				
Parameter	Data			
Release quantity:	175 tonnes/ yr of 1,2-DCB is released to the air in Southern Ontario			
Comments:	Release data provided by Environment Canada and the CEPA Priority Substance List Assessment Reports			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	Sources for release data are expected to be accurate.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data from Canada (OECD)	
	Metric 3: Applicability	Low	Data is not specific to any industry or CoU of o-DCB that would be in the scope of the RE (general release estimates)	
	Metric 4: Temporal Representativeness	Low	Data from 1993, older than 20 years	
	Metric 5: Sample Size	Low	Sample statistics are not provided	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Study only provides release estimates, no metadata given	
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:	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:	Various processing and use operations			
EXTRACTION				
Parameter	Data			
Description of release source:	11% from area source 5 (solvent purchased, gasoline marketed, agricultural sources, minor utility sources, minor point sources, cutback asphalt paving, manufacturing sources, bulk terminal and bulk plants, fugitives from petroleum refinery operations, crude oil and natural gas production fields, and structural fires) 18% from point source 2 (variety of manufacturing and processing industries)			
Release quantity:	1980 - 18,000 metric tons emitted in 1980.			
Comments:	Chemical group releases reported to National Acid Precipitation Assessment Program (NAPAP) and model species groups releases were assessed using the Regional Acid Deposition Model (RADM2.0)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	Release data methodology is from well-documented sources and expected to be accurate	
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	Low	Emission data from 1980, older than 20 years	
	Metric 5: Sample Size	Low	Data characterized by no statistics	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Includes release estimates only, no metadata	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty discussed, but not variability	
Overall Quality Determination		Medium		

Study Citation:	Midwest Research Institute, (1984). Performance evaluation of full-scale hazardous waste incinerators - Volume I (excutive summary) contract no. 68-02-3177 (43).
HERO ID:	1269556
Conditions of Use:	Disposal

EXTRACTION

Parameter	Data
Description of release source:	Eight hazardous waste incinerators were investigated, only one contained measured Dichlorobenzene in its stack effluent. Hazardous waste incinerator facilities
Release or emission factors:	Dichlorobenzene found in stack effluent at 2-4 micrograms/L for 1 site o-DCB was measured at 40,000, 46,000, and 64,000 micrograms/L in liquid waste feeds from one site
Waste treatment methods and pollution control:	An incinerator was rated at between 99.993% - 99.999% effective for removing o-DCB

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	The report is more than 20 years old. The report captures operations, equipment, and worker activities that are expected to be outdated.
	Metric 5:	Sample Size	High	Raw sample data provided
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	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.

Overall Quality Determination**High**

Study Citation:	Milbrandt, A., Coney, K., Badgett, A., Beckham, G. T. (2022). Quantification and evaluation of plastic waste in the United States. Resources, Conservation and Recycling 183:106363.
HERO ID:	11360398
Conditions of Use:	Recycling

EXTRACTION**Parameter****Data**

Release quantity:	Table 2 (page 4) provides total plastic waste managed in kt and % in the US in 2019 by plastic material by resin in recycled
Waste treatment methods and pollution control:	Plastic waste is typically recycled, sent to a landfill or material recovery facility, or incinerated.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	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, but is not chemical specific.
	Metric 4: Temporal Representativeness	High	The report was published in 2022 which is less 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	The report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The release data study does not address variability or uncertainty.

Overall Quality Determination**High**

Study Citation:	Milbrandt, A., Coney, K., Badgett, A., Beckham, G. T. (2022). Quantification and evaluation of plastic waste in the United States. Resources, Conservation and Recycling 183:106363.			
HERO ID:	11360398			
Conditions of Use:	Waste Handling			
EXTRACTION				
Parameter	Data			
Release quantity:	Table 2 (page 4) provides total plastic waste managed in kt and % in the US in 2019 by plastic material by resin in landfilled and combusted			
Waste treatment methods and pollution control:	Plastic waste is typically recycled, sent to a landfill or material recovery facility, or incinerated.			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	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, but is not chemical specific.
	Metric 4:	Temporal Representativeness	High	The report was published in 2022 which is less 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	The report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The release data study does not address variability or uncertainty.
Overall Quality Determination		High		

Study Citation:	Miller, C., Srivastava, R. K., Ryan, J. V. (1994). Emissions of organic hazardous air pollutants from the combustion of pulverized coal in a small-scale combustor. Environmental Science & Technology 28(6):1150.			
HERO ID:	5705544			
Conditions of Use:	disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	Flue Gases from combustion of pulverized coal			
Release quantity:	For all measured non- Title III VOCs (such as o-DCB), the total maximum emission factor was calculated to be 2.45 X 10^-6 g/MJ (5.71 X 10^-6 lb/106 Btu) in the baseline condition, 4.43 X 10^-6 g/MJ (1.03 X 10^-5 lb/106 Btu) for the stoichiometric variation condition, and 4.28 X 10^-6 g/MJ (9.96 X 10^-6 lb/10^6 Btu) for the low NOx condition.			
Release or emission factors:	combustion zone temperatures			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The release data methodology is known or expected to be accurate and is known to cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US data
	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 greater than 20 years old
	Metric 5:	Sample Size	Low	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		Medium		

Study Citation:	Monsanto Chemical Company, (1995). Whole effluent and chemical specific evaluation (o-dichlorobenzene) of Monsanto’s Antwerp plant aqueous discharge, with cover letter dated 07/10/95.			
HERO ID:	2048254			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	Wastewater effluent.			
Release quantity:	3 ppb see Table 6			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The release data methodology is known or expected to be accurate and is known to cover all release sources at the site.	
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	Low	The data were collected before the most recent federal regulatory action or update or are more than 20 years old if no federal regulation is established.	
	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	Medium	Release data include most critical metadata, including release media and release frequency, but lacks additional metadata, such as process, unit operation, and/or activity that is the source of the release.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The release data study does not address variability or uncertainty.	
Overall Quality Determination		High		

Study Citation:	(1994). Locating and Estimating Air Emissions from Sources of Chlorobenzenes (Revised March 1994).
HERO ID:	1998192
Conditions of Use:	Manufacturing, Processing as a Reactant, Dyes and Pigments, Use of Synthetic Dye and Pigments, Use of o-DCB as a processing solvent or reaction media, Disposal

EXTRACTION

Parameter	Data
Description of release source:	Equipment leaks can occur from the following components: pumpseals, process valves, compressor seals and safety relief valves, flanges, open-ended lines, and sampling connections (P. 39)
Release or emission factors:	Emission Factor (kg/hr/source) (p. 40)Valves: 0.00023-0.0071Pump seals: 0.0214-0.0494Compressor seal: 0.228Pressure Relief Seal: 0.104Open ended line: 0.0017Sampling connections: 0.015kg o-DCB emitted per Mg of o-DCB Produced (p. 52)Process: 2.32Storage: 0.47Fugitive: 0.76kg o-DCB emitted per Mg of o-DCB used (organic chem manufacturing)(p. 66)Process: 1.05Storage: 0.15Fugitive: 0.30kg o-DCB emitted per Mg of o-DCB used (Dyes and Pigments)(p. 85)Process: 0.4Storage: 0.05Fugitive: 0.05Disposal at a POTW (p. 107)0.41 MG/MG o-DCB in influentp. 109 contains EF's for Municipal Waste Combustion
Waste treatment methods and pollution control:	"A typical secondary treatment facility sequence utilized by many existing wastewater treatment facilities consists of screening, grit removal, primary clarification, use of conventional activated sludge with aeration, and chlorination. Due to the volatile nature of chlorobenzenes, air emissions are expected mainly from clarification and aeration processes. Measurements of the concentrations of chlorobenzenes in the effluent of the 42 MGD POTW discussed above suggest that the overall treatment process removes 40 to 90 percent of the incoming chlorobenzenes, primarily during activated sludge aeration. (p. 105)

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The release data methodology is known or expected to be accurate and is known to cover all release sources at the site.
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	Low	The data were collected are more than 20 years old. The operations, equipment, and worker activities are not available or indicate that the associated data are expected to be outdated.
	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 most critical metadata, including release media and release sources, but lacks additional metadata, such as 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.

Overall Quality Determination**High**

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o-Dichlorobenzene

Environmental Releases

HERO ID: 1998192 Table: 1 of 1

...continued from previous page

Study Citation:	(1994). Locating and Estimating Air Emissions from Sources of Chlorobenzenes (Revised March 1994).		
HERO ID:	1998192		
Conditions of Use:	Manufacturing, Processing as a Reactant, Dyes and Pigments, Use of Synthetic Dye and Pigments, Use of o-DCB as a processing solvent or reaction media, Disposal		
		EVALUATION	
Domain	Metric	Rating	Comments

Study Citation:	NYSDEC, (1984). 2-Chlorotoluene in Niagara R. effluents with transmittal letter dated 090784 (draft rept, incompl).			
HERO ID:	1335412			
Conditions of Use:	commercial use			
EXTRACTION				
Parameter	Data			
Release quantity:	The 1,2-DCB (o-DCB) loading in the Niagara Falls WWTP effluent was 3.9 kg/day (8.7 lbs/day)			
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	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	Low	The data presented is 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	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:	OECD, (2011). Emission scenario document on the chemical industry.			
HERO ID:	6306753			
Conditions of Use:	disposal			
EXTRACTION				
Parameter	Data			
Description of release source:	Releases include any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing into the environment of any chemical or chemical mixture. Emission sources include: • fugitive releases (including leaks) • point sources (venting of equipment and through incomplete separation) • residuals from (transport) containers (drums, tank trucks, rail cars) • equipment cleaning			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	information presented in the article is expected to be accurate
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	OECD country
	Metric 3:	Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	article is less than 10 years old
	Metric 5:	Sample Size	N/A	N/A - Data not based on sampling
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	N/A	N/A- Data not based on metadata completeness
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A- Data not based on metadata completeness
Overall Quality Determination			High	

Study Citation: programs, E.O. (1974). Air pollution control engineering and cost study of the paint and varnish industry.
HERO ID: 6580284
Conditions of Use: disposal

EXTRACTION

Parameter	Data
Description of release source:	There are two major types of emissions from a paint plant – non-fugitive (these are collected by and confined within an exhaust system with or without an air pollution control device) and fugitive (these escape into the plant atmosphere from various operations and exit the plant buildings through the doors and windows in an unregulated fashion). In today's typical paint plant there are two types of fugitive emissions - pigment particulate and paint solvents. The number of regulated emissions emanating from a paint plant will vary significantly with the type of operation involved. Some trade sales plants that manufacture none of their own resins and make no effort to confine solvent losses during dispersion, filtering, or storage, will have no non-fugitive emissions. On the other hand, resin plants or paint plants producing resins and varnishes are likely to have a number of non-fugitive emissions. These emissions consist primarily of organic vapors in air or inert gas streams. The major sources of emission are varnish cooking, resin cooking, and thinning. Minor sources of emissions are handling and storage, milling operation, blending and finishing, and filling.
Release quantity:	Considering a model plant with finished output of 1.9 million gallons, storage tank emission depends on the tank sizes and material stored, ranging from 30,900 gallon/year for 2,000-gallon tank storing waste solvent (50% xylene) to 257,000 gallon/year for 15,000-gallon tank storing alkyd. Emissions during filling xylene, mineral spirits, and glycerine. Estimated amount of emission during filling for the model plant is 184.8 lbs/yr. Emissions from model plant production area exhaust can be 47,500 lbs of xylene/yr. Emissions from the reactors can vary widely (numbers applicable to the model plant): alkyds emission range from 0.7 to 1.45 lbs/hr for 4000-gal reactor; polyester emission range from 1.32 to 27.3 lbs/hr for 4000-gal reactor; acrylics and melamines emission range from 0.06 to 0.21 lbs/hr for 400-gal reactor. Total gaseous emissions for the U.S.A. from paint production are estimated to be 23,200 tons for the year 1972.
Release or emission factors:	An average emission factor of 50,000 pounds gaseous emissions per million gallons of solvent based paint can be used. Emission factors were developed for this industry as a function of production capacity and type of product. Solvent emission factors were developed for three types of plants: plants producing resins only - 13,700 lb/MM lb resin; plants producing resins & paints - 45,000 lb/MM gal solvent based paint, and 5,460 lb/MM lb resin; plants producing paints only - 56,000 lb/MM gal solvent based paint.
Waste treatment methods and pollution control:	Emission control technologies include the following: best control systems for gaseous emission - flame incineration, thermal combustion, catalytic afterburners; best control systems for particulate emission – fabric collector. Technologies other than best control systems include scrubbers, and vapor condensation. Other engineering controls include raw material substitution for solvents, pigments, and changing process or operating conditions.

EVALUATION

Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The release data methodology is known or expected to be accurate
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US data
	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 is 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	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.

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o-Dichlorobenzene

Environmental Releases

HERO ID: 6580284 Table: 1 of 1

...continued from previous page

Study Citation:	programs, E.O. (1974). Air pollution control engineering and cost study of the paint and varnish industry.
HERO ID:	6580284
Conditions of Use:	disposal

		EVALUATION	
Domain	Metric	Rating	Comments
Overall Quality Determination		Medium	

Study Citation:	RIVM, (1991). Integrated criteria document chlorobenzenes. :281.
HERO ID:	5159927
Conditions of Use:	Disposal

EXTRACTION

Parameter	Data
Description of release source:	Waste incinerator
Release or emission factors:	Approximately 100 ng/Nm3 measured in flue gas (data read off a bar graph, figure 4.3)
Waste treatment methods and pollution control:	incineration

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Low	Methodology is not specified.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data from Netherlands (OECD)
	Metric 3: Applicability	High	Data for disposal (in-scope)
	Metric 4: Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5: Sample Size	Low	Sample distribution is only described by a graph.
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**Low**

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:	Intermediates in All other basic organic chemical manufacturing

EXTRACTION

Parameter	Data
Description of release source:	Process releases
Release quantity:	water: 0.91 - 12.9 lbs/day
Waste treatment methods and pollution control:	bio disc filters in aeration basins. 100% removed by the system.

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	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	Low	Data greater 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	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**Medium**

Study Citation:	U.S. EPA, (2023). Discharge Monitoring Report (DMR) data: o-Dichlorobenzene (oDCB), reporting years 2019-2023.			
HERO ID:	13243356			
Conditions of Use:	All			
EXTRACTION				
Parameter	Data			
Description of release source:	Provides media of release			
Release or emission factors:	Provides release data			
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 from 2019-2023.
	Metric 5:	Sample Size	Medium	Universe is limited to NPDES permit holders; statistical representativeness is unclear.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	DMR only includes release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	DMR does not address variability or uncertainty in submitter provided data.
Overall Quality Determination		Medium		

o-Dichlorobenzene

Environmental Releases

HERO ID: 13243357 Table: 1 of 1

Study Citation:	U.S. EPA, (2023). Toxics Release Inventory (TRI) data: o-Dichlorobenzene (oDCB), reporting years 2019-2023.			
HERO ID:	13243357			
Conditions of Use:	All			
EXTRACTION				
Parameter	Data			
Description of release source:	Provides the facility where the release occurs.			
Release quantity:	Provides release data by media for each reporting year.			
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	TRI is U.S. based data
	Metric 3:	Applicability	High	TRI includes industries included in multiple OES in scope.
	Metric 4:	Temporal Representativeness	High	TRI data are from 2019-2023.
	Metric 5:	Sample Size	Medium	Due to reporting requirements, statistical representativeness is unclear.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	TRI only includes release media and quantity but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	TRI does not address variability or uncertainty in submitter provided data.
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:	emissions			
EXTRACTION				
Parameter	Data			
Description of release source:	Emission sources listed in this article include waste oil combustors, multiple hearth sewage sludge incinerators, fluidized bed sewage sludge incinerators, and rail tank car cleaning			
Release quantity:	Emissions of 1,2-DCB from multiple hearth sewage sludge incinerators: uncontrolled - 3.7 E-1 g/Mg dry sludge burned (7.4 E-4 lb/ton dry sludge burned) with emission rating E; controlled source – venturi/impingement – 1.9 E-1 g/Mg dry sludge burned (3.8 E-4 lb/ton dry sludge burned) with emission rating E.			
Release or emission factors:	Emission factors for dichlorobenzene from waste oil combustors (Emission rating – D): Space Heaters - Vaporizing Burner - 8.0 E-7 kg/m3 (6.7 E-6 lbs/1000 gal); Space Heaters - Atomizing Burner – ND.Emission factors for 1,2-DCB for fluidized bed sewage sludge incinerators (Emission rating – D) - Venturi/Impingement – 64 g/Mg dry sludge burned (0.13 lb/ton dry sludge burned).Emission factors for 1,2-DCB for rail tank car cleaning (Emission rating – D) – 75.4 g/car (0.1662 lb/car)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	release data methodology is known
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	data are from the United States
	Metric 3:	Applicability	High	release data are 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	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	Medium	The release data study provides only limited discussion of the variability in the determinants of release, but none on uncertainty in the release results.
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2010). Manufacture and use of printing inks - generic scenario for estimating occupational exposures and environmental releases: Draft.
HERO ID:	6385710
Conditions of Use:	Manufacturing

EXTRACTION

Parameter	Data
Description of release source:	Environmental Releases:1. Releases from solid particulate during unloading2. Fugitive air releases from volatile liquids during unloading3. Container Residue4. Fugitive air releases from dispersion tank5. Fugitive air releases from milling6. Equipment cleaning residue7. Fugitive air releases from volatile components during loading of inkAdditional environmental releases are expected from waste streams associated with container and equipment cleaning.
Release or emission factors:	Table 2-4: 2007 TRI Data for Printing Ink ManufacturingAir Releases (lb/yr) - 190,832Water Releases (lb/yr):Surface Water - 29POTW/Wastewater - 823Land Releases (lb/yr) - 5,561Other Disposal (lb/yr) - 51,303
Waste treatment methods and pollution control:	Table 2-3: Summary of Control Technologies Used in Printing Ink ManufacturingRecovery Devices:CondensersAdsorption DevicesDust Collectors (e.g. bag house)Floating Roofs on Storage TanksDestructive Devices:Catalytic IncineratorsThermal IncineratorsVenturi ScrubbersEquipment/Process Modifications:Enclosed Oxidizing FlaresCovered Mixing TanksEnclosed Mills Use of Pigment Pastes (i.e. no particulates)Product Reformulation (e.g. convert to waterbasedor solid inks)

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The release data methodology is known or expected to be accurate. TRI data
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States
	Metric 3: Applicability	Medium	The release data are for an occupational scenario within the scope of the risk evaluation. Not specific to oDCB.
	Metric 4: Temporal Representativeness	Medium	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. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Release data include most critical metadata, including release media and release frequency, but lacks additional metadata, such as process, unit operation, and/or activity that is the source of the release.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	limited discussion of the variability or uncertainty.

Overall Quality Determination**High**

Study Citation:	U.S. EPA, (2010). Manufacture and use of printing inks - generic scenario for estimating occupational exposures and environmental releases: Draft.			
HERO ID:	6385710			
Conditions of Use:	Industrial use - Printing Operations			
EXTRACTION				
Parameter	Data			
Description of release source:	A large portion of the releases from the printing industry are associated with VOC emissions. These come from the volatile components in the printing inks as well as from various solvents that are used for equipment cleaning. Air emissions are likely to result from unloading inks into the ink reservoirs on the printing press, the generation of ink mist during high speed printing operations, and fugitive emissions from various source points in the printing process (e.g. ink reservoirs, drying ovens). Additional environmental releases of chemicals contained in printing inks can result from residual ink wastes from container cleaning, and disposal of rags and solvents used to wipe down and clean printing equipment. Inhalation exposure among production workers is likely to occur as a result of potential emissions with major contributions coming from ink handling and ink mist generation from printing equipment. Dermal exposure to inks and cleaning solvents are expected during material unloading and cleaning of the printing equipment.Environmental Releases:1. Container residue2. Fugitive air releases during unloading from volatile components3. Fugitive air releases from volatile components in ink reservoir4. Fugitive air releases from ink mist generated by printing press5. Equipment cleaning residuals6. Fugitive air releases of volatile components during drying			
Release or emission factors:	Table 2-5: 2007 TRI Data for Commercial Printing IndustryData from the 2007 Toxics Release Inventory was also collected and analyzed to identify recent trends in environmental release media for each major type of printing process. Table 2-5 summarizes the results from this data search.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The release data methodology is known or expected to be accurate. TRI data	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States	
	Metric 3: Applicability	Medium	The release data are for an occupational scenario within the scope of the risk evaluation. Not specific to oDCB.	
	Metric 4: Temporal Representativeness	Medium	more than 10 years but no 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	Release data include most critical metadata, including release media and release frequency, but lacks additional metadata, such as process, unit operation, and/or activity that is the source ofthe release.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	limited discussion of the variability or uncertainty.	
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:	Discharge

EXTRACTION

Parameter	Data
Description of release source:	Presents data for o-DCB for reporting years 2012 - 2019. 17 facilities from 7 states have reported in 2019. Different sources are indicated.
Release quantity:	Presents data for o-DCB for reporting years 2012 - 2019. 17 facilities from 7 states have reported in 2019. Release quantities to different media is indicated. For example, release to air via stacks for these facilities ranged between 0 and 8,300 lbs in 2019.
Waste treatment methods and pollution control:	Data indicates the amount of waste treated onsite or offsite. However, it does not provide information on waste treatment methods and how pollution is controlled.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The release data methodology is known or expected to be accurate and is known to cover all release sources at the site.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States
	Metric 3: Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	The release data is no more than 10 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
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The release data study does not address variability or uncertainty.

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:	Total On-site Disposal or Other Releases - 49,587 lbsTotal Off-site Disposal or Other Releases – 0 lbsTotal On- and Off-site Disposal or Other Releases - 49,587 lbs
Waste treatment methods and pollution control:	no information provided

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The release data methodology is known or expected to be accurate and is known to cover all release sources at the site.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation
	Metric 4: Temporal Representativeness	High	The release data is no more than 10 years old
	Metric 5: Sample Size	Low	Distribution of samples 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**Medium**

Study Citation:	Atasoy, E., Döğeroğlu, T., Kara, S. (2004). The estimation of NMVOC emissions from an urban-scale wastewater treatment plant. Water Research 38(14-15):3265-3274.
HERO ID:	3572863
Conditions of Use:	Disposal

EXTRACTION	
Parameter	Data
Description of release source:	sewage treatment plant (air)
Release quantity:	Table 3: Modelled emission factors priority chemicals. o-DCB = 0.0269 t/yr total emissions
Release or emission factors:	Table 4: Calculated flux: o-DCB total flux: 1223.4E-10 g/(cm2*h) EPA's AP-42
Comments:	Table 4: Calculated flux: o-DCB total flux: 1223.4E-10 g/(cm2*h)EPA's AP-42

		EVALUATION	
Domain	Metric	Rating	Comments
Domain 1: Reliability			
	Metric 1: Methodology	High	Model is peer-reviewed and free of mathematical errors, based on sound approaches/methods, and uses appropriate equations and parameters.
Domain 2: Representativeness			
	Metric 2: Geographic Scope	Medium	Data from Turkey (OECD)
	Metric 3: Applicability	High	The model can be appropriately applied to an occupational scenario within the scope of the risk evaluation.
	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	High	Model approach, equations, and choice of parameter values are transparent and clear and can be evaluated. Rationale for selection of approach, equations, and parameter values is provided
Domain 4: Variability and Uncertainty			
	Metric 6: Metadata Completeness	Low	Variability and uncertainty are not addressed

Overall Quality Determination	High
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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:	Aeration tanks (continuous and batch)			
Release or emission factors:	Table 3: Modelled emission factors priority chemicals. o-DCB = 2.54 /h			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Model is free of errors and is based on sound scientific methods
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data from Taiwan (Non-OECD)
	Metric 3:	Applicability	High	The model can be appropriately applied to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Model from 1999 (>20 years)
Domain 3: Accessibility/ Clarity	Metric 5:	Metadata Completeness	High	Model approach, equations, and choice of parameter values are transparent and clear and can be evaluated. Rationale for selection of approach, equations, and parameter values is provided
Domain 4: Variability and Uncertainty	Metric 6:	Metadata Completeness	Medium	Variability between waste treatment processes is discussed
Overall Quality Determination			High	

Study Citation:	NICNAS, (2001). Priority existing chemical assessment report no. 14: Ortho-dichlorobenzene.			
HERO ID:	5155563			
Conditions of Use:	Processing			
EXTRACTION				
Parameter	Data			
Release quantity:	Total annual release of o-DCB is estimated as 58% (5,800 kg)			
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 from Australia (OECD)
	Metric 3:	Applicability	Medium	Data are for foreign formulation, which may be applicable to domestic processing (in-scope)
	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.
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, (2011). Emission scenario document on coating application via spray-painting in the automotive refinishing industry.			
HERO ID:	3808976			
Conditions of Use:	Use - Automotive Coating Application			
EXTRACTION				
Parameter	Data			
Description of release source:	Container cleaning, equipment cleaning, coating application (overspray)			
Release or emission factors:	Release or Emission Factor - Container cleaning: 0.6% Equipment Cleaning: 2% Spray Coating: 35-80%			
Waste treatment methods and pollution control:	incineration. P2 Control & %Efficiency: Prep stations, spray booths, or enclosed spray coating areas, general or local exhaust ventilation with dry filters: 96%			
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 multiple in-scope occupational scenarios; 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 coating types.
Overall Quality Determination			High	

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

EXTRACTION

Parameter	Data
Description of release source:	PROC: material loading, heat-up, surface evaporation, filling, micellaneous operations, material storage, leaks, spills USE: Application losses, equipment residues, drum residues
Release or emission factors:	Release or Emission Factor: "PROC: Equipment residues: 0.5-1% (organic solvent-borne); 0.5-1% (water-borne); 0.5-1% (powder) Raw material packaging residues: 0.2-5% (organic solvent-borne); 0.2-5% (water-borne); 0.5% (powder) Air Emissions: 0.07-3.6% (organic solvent-borne); 0.03-2.25% (water-borne) Dust Emissions: 0.5-1% (organic solvent-borne); 0.5-1% (water-borne); 0.5-1.5% (powder) Flaking/crushing/transfer (powder only): 0.5-1.5% Cyclone Emissions (powder only): 2-5% Extruder waste (powder only): 1% USE: Equipment residues: 5% (wood); 1% (coil); 5% (aerospace); 5% (rail) container residues: 0.5% (wood); 3% (decorative); 1.5% (metal); 0.5-3% (coil) Application: 20-70% (wood spray); 1% (wood roll/curtain); 1% (decorative); 20-50% (automotive OEM); 50-60% (auto refinishing); 3% (metal); 35% (marine); 32% (aerospace); 10-25% (rail) Process scrap: 1% (metal) Quenching: 0.25% (coil) Sanding: 2% (rail) Volatiles only: 100% of chemical not released elsewhere."
Waste treatment methods and pollution control:	incineration. P2 Control & %Efficiency: 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
	Metric 3:	Applicability	Medium
	Metric 4:	Temporal Representativeness	Medium
	Metric 5:	Sample Size	Medium
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, (2004). Emission scenario document on lubricants and lubricant additives.		
HERO ID:	3827416		
Conditions of Use:	Formulation and Use of Automotive Lubricants, Hydraulic Fluids, and Metal Working Fluids		
EXTRACTION			
Parameter	Data		
Description of release source:	Releases during formulation of fluids and lubricants - emissions to air, water, and land during blending process; releases during the use of fluids and lubricants		
Release or emission factors:	Table D1 presents emission factors for crankcase oils and additives due to leakage. (pg. 117)Various sections describe how to calculate the emission factors for different scenarios.		
Release frequency:	Emission estimates are for daily emissions. For the base fluids, it is probably reasonable to assume that they will be used throughoutthe year and hence usage over 300 days is appropriate. (pg. 64)		
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	The document is based on a report produced by the Building Research Establishment for the UK Environment Agency. The original purpose of the document was to provide information to be used in risk assessments for new and existing substances in the EU. Data are from OECD countries.
	Metric 3: Applicability	Medium	Data is for in-scope occupational scenarios; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old. The assessment captures operations, equipment, and worker activities 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	Uncertainty not addressed. Variability addressed by considering various types of lubri-cants and fluids.
Overall Quality Determination		Medium	

Study Citation:	OECD, (2009). Emission scenario document on plastic additives.			
HERO ID:	5079084			
Conditions of Use:	Processing- Plastics Compounding and Converting			
EXTRACTION				
Parameter	Data			
Description of release source:	Raw material handling, compounding, converting, service life, disposal			
Release or emission factors:	Release/emission factor - Provides emission factors based on the type of additive and the type of process used for compounding and converting			
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, (2020). Emission scenario document on chemical additives used in automotive lubricants.
HERO ID:	6385735
Conditions of Use:	Processing and Use - Formulation and Use of Automotive Lubricants

EXTRACTION

Parameter	Data
Description of release source:	PROC: unloading, container cleaning, blending, sampling, equipment cleaning, loading USE: unloading, container cleaning, disposal of spent lube oil
Release quantity:	Provides models for estimating various fugitive air releases
Release or emission factors:	Release/emission factor: PROC: Container cleaning: 0.2% (bulk liquids), 0.6% (small containers for liquids), 3% (drums for liquids) Equipment Cleaning: 1% USE: Container cleaning: 0.2% (bulk liquids), 0.6% (small containers for liquids), 3% (drums for liquids) Disposal: 97-99.8%
Release frequency:	Processing: 203-360 Use: 253
Waste treatment methods and pollution control:	PROC: incineration USE: incineration. P2 Control & %Efficiency: PROC: incineration, LEV, scrubbers, physical/chemical treatments, ultrafiltration, oxidation, evaporation/distillation, oil/water separation, dissolved air flotation, and biological treatment USE: incineration, scrubbers

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 multiple in-scope occupational scenarios; 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 multiple additive types.

Overall Quality Determination**High**

Study Citation:	OECD, (2009). Emission scenario document on transport and storage of chemicals.
HERO ID:	6393282
Conditions of Use:	ProcessingTransportation 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:	Science Applications International Corporation, (1996). Generic scenario for automobile spray coating: Draft report.
HERO ID:	6311222
Conditions of Use:	Automotive Coating Application

EXTRACTION

Parameter	Data
Description of release source:	"Auto OEM: blowdown, sludge processing, generated sludge, stack air releasesAutorefinish: air filter waste from overspray, stack air"
Release or emission factors:	"Auto OEM: Spray coating: 35%Equipment cleaning: 1%Container cleaning: 0.2-4%Autorefinishing: Spray coating: 75%Equipment cleaning: 1%Container cleaning: 0.6-4%"
Release frequency:	"Auto OEM: sludge pit cleaning: 1 day/yr All other releases: 250 days/yrAutorefinish: 170 days/yr"
Waste treatment methods and pollution control:	incineration"Auto OEM: Paint booth removal efficiency: 92.9-99.8%Solids removal in Water booth: 90%Autorefinishing: 87-99.8% paint booth removal 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	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	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 OEM and refinish applications.

Overall Quality Determination**High**

Study Citation:	U.S. EPA, (2002). Flexographic ink options: A cleaner technologies substitutes assessment. Volume 1.			
HERO ID:	10293388			
Conditions of Use:	Use of flexographic inks			
EXTRACTION				
Parameter	Data			
Release or emission factors:	emission factors for ink components listed on p. 148			
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	The data are from the United States and are representative of the industry being evaluated.
	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 ink types.
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:	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:	media: Water, air, landfill 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			
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:	Table 4-1 presents a summary of assessed releases (pg 22 of 116)			
Waste treatment methods and pollution control:	Wastewater produced at repackaging sites may be managed in a variety of ways depending on the facility-specific permitting requirements and the applicable effluent guidelines, which may vary widely due to the range of industrial sectors that perform repackaging operations. However, because there are regulatory standards for wastewater discharges in the United States, EPA expects wastewater containing the chemical of interest will be treated prior to discharge. Therefore, this GS assesses water releases as wastewater that may be treated on-site and discharged to a surface water or to a publicly-owned treatment works (POTW) or transferred off-site for treatment and discharge (pg 21 of 116)			
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
	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	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2021). Use of chemicals in fuels and related products - Generic scenario for estimating occupational exposures and environmental releases (Methodology review draft).
HERO ID:	11203977
Conditions of Use:	Use in Fuels and related Products

EXTRACTION

Parameter	Data
Description of release source:	Figure 2-1 (13 of 76) shows the release sources and sections 2.1 through 2.3 (pg 14 of 76) discussed the associated release sources.Receiving and Storage of Fuel at Fueling StationsChemicals in fuels and related products are expected to be received at use sites (i.e., fueling stations) via tank trucks, rail cars, tankers, barges, and pipelines. The fuels are then transferred from these transport containers to on-site storage tanks, typically through pipes and hoses. Workers may be potentially exposed during the unloading of fuel from the original transport containers into on-site storage tanks. Releases of chemicals may also occur during this stage, from storage tank working losses during the unloading of the fuel from transport containers into storage tanks, and from cleaning of transport containers. Additionally, equipment leaks may result from valves, flanges, and connectors (EPA, 1999).Dispensing of Fuel from Storage Tank to EngineAt the use site, fuels are dispensed from storage tanks to vehicles or other equipment. Storage tanks for fuel are typically underground, and fuel is pumped upwards through tubes and nozzles. Workers may be potentially exposed during the transfer of fuel from the storage tank to a vehicle or other equipment, where not conducted by the consumer. Releases of chemicals may also occur during this stage. Releases of small amounts of gasoline vapors have been shown to occur at service stations during refueling of vehicles (ATSDR, 1995). Most releases come from displacement of hydrocarbon vapors during filling of the vehicle. Some release may also occur from spills, line leaks, and storage tank leaks. Volatile hydrocarbons in fuel spilled on soil or surface water will rapidly evaporate into the air (ATSDR, 1995).Combustion of FuelDuring combustion, fuel is burned to provide energy to an engine. In a typical internal combustion engine, fuel is mixed with air in a chamber. This mixture is ignited with a spark and energy from the burning fuel is used to power the vehicle or machine. Exhaust gases leave through a tailpipe or vent (EPA, 1999). Byproducts of fuel combustion are released with exhaust gases into the atmosphere during engine use. Compounds formed during the combustion of fuel include hydrocarbons, carbon monoxide, nitrogen oxides, particles, carbon dioxide, sulfur compounds, and aldehydes (Hancsok, 2016). Workers may or may not be exposed to these combustion byproducts, depending on their proximity to the engine.
Release quantity:	To estimate annual releases across all sites from a given release source, the daily release rates must be multiplied by the number of release days (i.e., TIMEoperating_days).and the total number of sites using the chemical of interest (i.e., Nsites). Some process releases are expected to occur to the same receiving medium on the same days (pg 26 of 76)
Release or emission factors:	AP-42 Emission Factors may be used to estimate the rate at which the chemical of interest is emitted during this activity (pg 58 of 76)
Release frequency:	the number of operating days associated with fueling stations (TIMEoperating_days) should be assumed to be 365 days/yr (pg 16 of 76)
Waste treatment methods and pollution control:	Pg 27 of 76: Various use sites may employ different types of control technologies to reduce the wastes and emissions generated during the use of fuels and related products. According to EPA's AP-42, current controls for Liquified Petroleum Gas combustion at industrial sites include retrofit systems that implement low-NOx burners and flue gas recirculation (EPA, 2008). In terms of loading losses and equipment leaks, typical control techniques include submerged loading, storage tanks with internal floating roofs, carbon adsorption, and leak detection and repair systems. These techniques have an efficiency anywhere between 58-99% (EPA, 1999).Last, to minimize combustion emissions, many vehicle and machine engines now include combustion improvement technologies. Some of these technologies include advanced variable geometry turbocharger with inter cooling, ultrahigh injection pressures, electronic fuel injection and control, exhaust gas recycle with temperature management, onboard diagnostics, catalytic exhaust converters (aftertreatment systems), lean de-NOx catalyst, and regenerative diesel particulate filters (Hancsok, 2016).

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

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Environmental Releases

...continued from previous page

Study Citation:	U.S. EPA, (2021). Use of chemicals in fuels and related products - Generic scenario for estimating occupational exposures and environmental releases (Methodology review draft).
HERO ID:	11203977
Conditions of Use:	Use in Fuels and related Products

EVALUATION

Domain	Metric	Rating	Comments
	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	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty			
	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized

Overall Quality Determination

High

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:	Processing-plastic materials

EXTRACTION

Parameter	Data
Description of release source:	Environmental Releases:1. Container residue from additive transport container released to water, incineration, or landfill.2. Dust generation from transferring/compounding released to water or landfill.3. Fugitive air emissions from compounding/shaping released to water or air.4. Equipment cleaning and cooling water from compounding released to water
Release or emission factors:	1.Container Residue from Original Additive Transport Container (Release 1)Number of Containers (containers/site-year) = Daily Use Rate (kg/site-day) x Days of Operation (days) / Fraction of Chemical in additive / Container Volume (L/container) / Density (kg/L)Example for antioxidant transported in drums:115 containers/site-yr = 96 kg/site-day x 250 days / (1 x 208 L/container x 1 kg/L)If the number of containers is less than the days of operation, the days of release is equal to the number of containers, and the daily release is calculated based on the following formula:Daily Release from Container Residue (kg/site-day) = Container Volume (L/container) x Density (kg/L) x Fraction of Chemical in additive x Loss FractionExample for solid antioxidant transported in drums:2.08 kg/site-day = 208 L/container x 1 kg/L x 1 x 0.01If the number of containers is greater than the days of operation, the days of release is equal to the days of operation, and the daily release is calculated based on the following formula:Daily Release from Container Residue (kg/site-day) = Daily Use Rate (kg/site-day) x Loss Fraction2.Dust from Compounding Released to Water or Landfill (Release 2)Example of solid antioxidant additive:0.62 kg/site-day released = 96 kg/site-day x 0.0065 loss fraction3. Fugitive Air from Compounding Released to Water or Air (Release 3)Daily release to water from volatilization = daily use rate x loss fractionExample of solid antioxidant additive:0.024 kg/site-day released = 96 kg/site-day x 0.00025Daily release to air from volatilization = daily use rate x loss fractionExample of solid antioxidant additive:0.024 kg/site-day released = 96 kg/site-day x 0.000254. Residual from Compounding Equipment Cleaning (Release 4)Daily release from equipment cleaning = daily use rate x loss fractionExample for antioxidant additive1.9 kg/site-day released = 96 kg/site-day x 0.02
Waste treatment methods and pollution control:	Control Technologies: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 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 or report uses high quality data and/or techniques or sound methods that are from a frequently used source. EPA generic scenario document.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High
	Metric 3:	Applicability	High
	Metric 4:	Temporal Representativeness	Medium
	Metric 5:	Sample Size	High
			Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High
			Assessment or report clearly documents its data sources, assessment methods, results, and assumptions

Continued on next page ...

o-Dichlorobenzene

Environmental Releases

HERO ID: 6311218 Table: 1 of 1

...continued from previous page

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:	Processing-plastic materials		
Domain		EVALUATION	
		Rating	Comments
Domain 4: Variability and Uncertainty			
Metric 7:	Metadata Completeness	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination		High	

Study Citation:	U.S. EPA, (2000). Leather dyeing - Generic scenario for estimating occupational exposures and environmental releases (draft).			
HERO ID:	6311220			
Conditions of Use:	Leather dyeing			
EXTRACTION				
Parameter	Data			
Description of release source:	Air releases considered negligible based on low vapor pressures for most dye chemicals. Water releases expected from exhausted dyebath solution. Land releases from container residue and scrap/off-spec material.			
Release or emission factors:	"Release based on degree of exhaustion, which ranges from 60-95% (calculated as dye not exhausted on leather)1.1% of PV released to landfill"			
Waste treatment methods and pollution control:	Either wastewater or landfill (no incineration)			
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	Low	Assessment is based on data greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distributions characterized by ranges/estimations and some state 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 both liquid and solid physical forms and different degrees of fixation.
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2001). Manufacture and use of printing ink - Generic scenario for estimating occupational exposures and environmental releases (revised draft).
HERO ID:	6311221
Conditions of Use:	Industrial Use: Solvents (printing ink)

EXTRACTION

Parameter	Data
Description of release source:	"Manufacturing printing inks may release the chemical substance into the environment (water, air, incineration, or land) via packaging disposal, material transfer, ink processing, or equipment cleaning. The type of release will be dependent upon the type of chemical substance (liquid or solid) and the ink base (water, oil, or solvent). The chemical substance will be released to water during clean-out of the process equipment if the ink is water-based. Non water based inks are expected to be cleaned with solvents. Solvent waste is expected to be disposed of via incineration, resulting in no release of PMN chemical to water" (pg. 33-34/54)"Releases to air are expected during material loading, final product filling, and possibly from surface evaporation (if the mixer lid is open or if VOCs are emitted from the grinder chute). Surface Evaporative releases are limited to volatile chemicals, whereas material loading and final product filling may result in vapor or particulate releases" (pg. 34/54)
Release quantity:	"An air release estimate for volatile components (VP \$ 0.01 torr) can be made based on ink manufacturing sites reporting to the Toxics Release Inventory (TRI). The 135 ink manufacturing plants reporting to the 1992 TRI reported an average release rate of 26 kg/day of VOCs. Non-volatile liquid components (VP<0.01 torr) are not expected to be released to air." (pg. 34/54)
Release or emission factors:	"CEB estimates two percent of chemical residue remains overall in the process equipment after each batch." (pg. 34/54)Table 9, pg. 43/54, provides VOC component emission factors
Release frequency:	"Cleaning of the process equipment may occur after every batch." (pg. 34/54)
Waste treatment methods and pollution control:	incineration
Comments:	Note: This is not the most recent version of the Inks GS

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 (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, 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	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The completed exposure or risk assessment is more 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	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

Continued on next page ...

o-Dichlorobenzene

Environmental Releases

HERO ID: 6311221 Table: 1 of 1

...continued from previous page

Study Citation:	U.S. EPA, (2001). Manufacture and use of printing ink - Generic scenario for estimating occupational exposures and environmental releases (revised draft).
HERO ID:	6311221
Conditions of Use:	Industrial Use: Solvents (printing ink)

		EVALUATION	
Domain	Metric	Rating	Comments
	Metric 7: Metadata Completeness	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.

Overall Quality Determination	High
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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:	All

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 scenarioMost 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**High**

Study Citation:	U.S. EPA, (1999). Flexographic printing - generic scenario for estimating occupational exposures and environmental releases: Draft.			
HERO ID:	6385709			
Conditions of Use:	Ink and Toners			
EXTRACTION				
Parameter	Data			
Description of release source:	equipment cleaning, fugitive air, stack air			
Release or emission factors:	"Fugitive air: 30%Stack air: 5% (solvent-based ink); 70% (UV-cured and water-based inks)"			
Release frequency:	300 days/yr			
Waste treatment methods and pollution control:	incineration			
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	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	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2004). Spray coatings in the furniture industry - generic scenario for estimating occupational exposures and environmental releases: Draft.
HERO ID:	6385719
Conditions of Use:	Furniture Coating Application

EXTRACTION

Parameter	Data
Description of release source:	container cleaning, equipment cleaning, coating application (overspray), volatile air emissions incineration
Release or emission factors:	"Container cleaning: 3%Equipment Cleaning: 2%Application losses: 35-75% (spray)Volatile: 100% of chemical not released elsewhere"
Release frequency:	250 days/yr
Waste treatment methods and pollution control:	spray booths with dry filters: 90-99%

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 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	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 wood vs metal furniture uses

Overall Quality Determination**High**

Study Citation:	CDC, (2009). Fourth national report on human exposure to environmental chemicals.			
HERO ID:	664488			
Conditions of Use:	use			
EXTRACTION				
Parameter	Data			
Description of release source:		synthesis of dyes, pesticides, and other industrial products		
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	report uses high 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 report is for an occupational scenario within the scope 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	characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			High	

Study Citation:	Charles, J., Crini, G., Morin-Crini, N., Badot, P. M., Trunfio, G., Sancey, B., Carvalho, de, M., Bradu, C., Avramescu, S., Winterton, P., Gavaille, S., Torri, G. (2014). Advanced oxidation (UV-ozone) and cyclodextrin sorption: Effects of individual and combined action on the chemical abatement of organic pollutants in industrial effluents. Taiwan Institute of Chemical Engineers. Journal 45(2):603-608.
HERO ID:	2405880
Conditions of Use:	Unknown industrial use

EXTRACTION

Parameter	Data
Description of release source:	Industrial releases. EEA Industry in Jura, France (unsure what they produce)
Release or emission factors:	"Table 5: Industrial effluent with no treatment: 7.2-139.7(+/- 57.5) µg/LOxidation and sorption onto CD: <0.01 µg/LOxidation and sorption onto starch: <0.01 µg/L"
Waste treatment methods and pollution control:	Combinations of oxidation (UV-ozone) and sorption on starch and cyclodextrin. P2 control "Oxidation and sorption onto CD: 100% +/- 0 Oxidation and sorption onto starch: 100% +/- 2"

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Published by the . Journal of the Taiwan Institute of Chemical Engineers - expected to be accurate
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data from Taiwan (Non-OECD)
	Metric 3: Applicability	Medium	Potentially applicable to industries with waste effluent containing o-DCB
	Metric 4: Temporal Representativeness	High	Report from 2014 (<10 years)
	Metric 5: Sample Size	Medium	Samples characterized by ranges with standard deviations
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.

Overall Quality Determination**High**

Study Citation:	Clapp, L. W., Talarczyk, M. R., Park, J. K., Boyle, W. C. (1994). Performance comparison between activated-sludge and fixed-film processes for priority pollutant removals. Water Environment Research 66(2):153-160.			
HERO ID:	3585789			
Conditions of Use:	Manufacturing, Processing, Use			
EXTRACTION				
Parameter	Data			
Waste treatment methods and pollution control:	"Activated sludge removal - > 97% (high-loaded and low-loaded) Biological aerated filter (BAF) - 58% "			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Published in Water Environmental Research (not frequently used but expected to be accurate)
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	Data not specifically for in-scope use but may be applicable to CoU's in scope
	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 (averages) 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 the analytical method. Variability addressed by varying the loading of the treatment methods.
Overall Quality Determination		High		

Study Citation:	Cudahy, J. J. (1998). Low waste feed concentrations and destruction removal efficiency. Waste Management 18(6-8):453-459.
HERO ID:	1487499
Conditions of Use:	Disposal

EXTRACTION

Parameter	Data
Waste treatment methods and pollution control:	99.997% DRE from incineration
Comments:	Incineration

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Information is from not frequently used but well-documented sources and expected to be accurate
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	Data for in scope use
	Metric 4: Temporal Representativeness	Low	Data from 1998 (>20 years old)
	Metric 5: Sample Size	N/A	N/A - information not dependent on samples
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Source summarizes results of previous study
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The release data study does not address variability or uncertainty.

Overall Quality Determination**Medium**

o-Dichlorobenzene

Environmental Releases

HERO ID: 1924634 Table: 1 of 1

Study Citation:	Dold, P. L. (1989). Current practice for treatment of petroleum refinery wastewater and toxics removal. Water Pollution Research Journal of Canada 24(3):363-390.			
HERO ID:	1924634			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Waste treatment methods and pollution control:	pg 22 of the .pdf mentions a process where powdered activated carbon was added to a sludge waste system and o-DCB removal improved substantially. No other information for o-DCB.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Information is from well-documented sources and expected to be accurate
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Information from Canada (OECD)
	Metric 3:	Applicability	Uninformative	No applicable information for o-DCB
	Metric 4:	Temporal Representativeness	Low	Data from 1989 (>20 years old)
	Metric 5:	Sample Size	N/A	N/A - information not dependent on samples
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		Uninformative		

Study Citation:	EC, (1987). Guidelines for Canadian drinking water quality: Guideline technical document – Dichlorobenzenes.			
HERO ID:	7681885			
Conditions of Use:	Industrial use			
EXTRACTION				
Parameter	Data			
Waste treatment methods and pollution control:	Removal of volatile organic compounds by packed tower aeration and granular activated carbon adsorption has been estimated to be 90 to 99% effective,			
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 (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, 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	Medium	The data are from an OECD country other than the U.S. (Canada).
	Metric 3:	Applicability	Medium	The report is not for a specific occupational scenario, but contains information that may be relevant 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	The report is more than 20 years old. The report captures operations, equipment, and worker activities that are expected to be outdated.
	Metric 5:	Sample Size	N/A	N/A - Data not based on sampling
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 report does not address variability or 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:	Plastics compounding/converting

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 surface coating operations. (p. 17)
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" (p. 21)

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High
			The assessment or report uses high quality data that are from frequently used sources 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	High
	Metric 4:	Temporal Representativeness	Low
	Metric 5:	Sample Size	N/A
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**High**

Study Citation:	Marshall, K. A., Pottenger, L. H. (2016). Chlorocarbons and chlorohydrocarbons. :1-29.			
HERO ID:	3828879			
Conditions of Use:	disposal			
EXTRACTION				
Parameter	Data			
Waste treatment methods and pollution control:	Regulations are in place to control the use and disposal of these substances. Within the manufacturing environment, waste minimization is typically the first priority, and is achieved through adoption of efficient technologies. Secondly, wastes and by-products that are generated are reused as feedstock for other processes whenever possible. Any by-products of manufacture that cannot be utilized must be destroyed in a manner to prevent harm to the environment. These wastes are considered hazardous and are regulated under the federal Resource Conservation and Recovery Act (RCRA). Conventional disposal of chlorinated hydrocarbon wastes has been achieved by high temperature incineration. This process produces aqueous HCl, water, and carbon dioxide, and steam is cogenerated.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	data are from the United States
	Metric 3:	Applicability	High	report is for an occupational scenario within the scope of the risk evaluation
	Metric 4:	Temporal Representativeness	Medium	The report captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions.
	Metric 5:	Sample Size	N/A	N/A - information not dependent on samples
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - information not dependent on metada completeness
Overall Quality Determination		High		

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:	Paint and coating manufacturing			
EXTRACTION				
Parameter	Data			
Description of release source:		Spent cleaning solvents are the largest liquid waste produced by coated and laminated substrate manufacturers. Many of these solvents are recoverable through distillation and can be incorporated in a future coating formulation; however, they may also be sent off-site for disposal. A second liquid waste stream consists of excess or off-specification coating.		
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	Low	The source contains information for an in-scope CoU, however there is no specific mention of o-DCB, only general solvents
	Metric 4:	Temporal Representativeness	Low	The report is more than 20 years old. The report captures operations, equipment, and worker activities that are expected to be outdated.
	Metric 5:	Sample Size	N/A	N/A - data not based on samples
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 report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	U.S. EPA, (1991). Granular detergents manufacture - generic scenario for estimating occupational exposures environmental releases: Draft.
HERO ID:	6385740
Conditions of Use:	cleaning and washing agent

EXTRACTION

Parameter	Data
Description of release source:	equipment cleaning, spillage
Release or emission factors:	"Equipment Cleaning: 1% (aqueous), 1% (solid wastes)Spillage: 0.5% (aqueous), 1% (solid wastes)"
Waste treatment methods and pollution control:	Collector, scrubber, precipitators

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	Low	Assessment is based on data greater than 20 years old.
	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 is addressed by considering multiple chemical physical forms

Overall Quality Determination**Medium**

Study Citation:	U.S. EPA, (1995). Chapter 6: Organic chemical process industry. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.			
HERO ID:	7310513			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Waste treatment methods and pollution control:	Pharmaceutical industry releases o-DCB to wastewater (Sewer) (98%) and air emissions (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	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 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	The report is more than 20 years old. The report captures operations, equipment, and worker activities that are expected to be outdated.
	Metric 5:	Sample Size	N/A	N/A - Data not based on sampling
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 report does not address variability or uncertainty.
Overall Quality Determination		Medium		

Study Citation:	Ware, G. W. (1988). Ortho-, meta-, and para-dichlorobenzene. Reviews of Environmental Contamination and Toxicology 106:51-68.			
HERO ID:	4912307			
Conditions of Use:	Manufacturing, Processing, Use			
EXTRACTION				
Parameter	Data			
Waste treatment methods and pollution control: "air stripping towers - 83 - 97% diffused-air aerator - 74% "				
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 from US
	Metric 3:	Applicability	High	Waste-treatment is in-scope
	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:	Zaman, R. (1992). Solving air emissions problems from metal cleaning operations. The National Environmental Journal 2(4):44.
HERO ID:	5489562
Conditions of Use:	commercial and consumer uses

EXTRACTION

Parameter	Data
Description of release source:	The largest losses of solvent are usually caused by diffusion. Such losses occur at the vapor/air interface when the system is operating. Moving air contributes to diffusional losses. A draft velocity as low as 40 feet per minute will increase losses, while a draft of 100 feet per minute will double losses. Diffusional losses also occur between the liquid/air interface when the machine is idling or shut down. These downtime losses are significant when low boiling point solvents are used in open top systems or systems that are continuously vented.
Waste treatment methods and pollution control:	Many options exist for reducing these emissions. Proper design of the cleaning system is the first step in reducing emissions, and should be considered prior to any other approach. Once the equipment design is optimized, selection of the proper solvent can play an important role in minimizing emissions. To reduce the amount of liquid solvent waste, a recycling program can be implemented. Finally, if emissions remain too excessive with such controls in place, it will become necessary to implement a process change and use a completely different method of cleaning the parts.

EVALUATION

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Methodology is expected to be accurate
Domain 2: Representativeness	Metric 2: Geographic Scope	High	US data
	Metric 3: Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	The article is greater than 20 years old
	Metric 5: Sample Size	N/A	N/A - information not dependent on samples
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	N/A	N/A - information not dependent on metadata
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A - information not dependent on metadata

Overall Quality Determination**High**

Study Citation:	OECD, (2011). Emission scenario document on coating application via spray-painting in the automotive refinishing industry.		
HERO ID:	3808976		
Conditions of Use:	Use - Automotive Coating Application		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	54,633,000 total gallons automotive refinish coatings/yr 99,747 - 1,097,457 gallons coating/yr (depending on coating type)		
Process description:	Repair/replace automotive surface, initial wash (water/detergent and/or solvent), sanding (dry or wet), mixing of primer coatings, spray paint (multiple layers of primer), curing/drying each layer, sanding (dry or wet), solvent wipe-down, mixing of each coating (basecoat and clearcoat), spray paint (multiple layers of basecoat and clearcoat), curing/drying each layer		
Throughput:	0.25-12 gal coating/site-day, depending on number of jobs Also provides method for adjusting the use rate based on the type of coating product used		
Number of sites:	32,296		
Chemical concentration:	15-25%		
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 multiple in-scope occupational scenarios; 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 limited statistics (min, max, 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	Medium	Uncertainty not addressed. Variability addressed by considering multiple coating types.
Overall Quality Determination		High	

Study Citation:	OECD, (2009). Emission scenario documents on coating industry (paints, lacquers and varnishes).			
HERO ID:	3827298			
Conditions of Use:	Processing and 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	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 chemical functions and coating types	
Overall Quality Determination		High		

Study Citation:	OECD, (2004). Emission scenario document on lubricants and lubricant additives.		
HERO ID:	3827416		
Conditions of Use:	Formulation and Use of Automotive Lubricants, Hydraulic Fluids, and Metal Working Fluids		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	UK lubricants industry production : 800,000 tonnes/year (Table 1.1)		
Life cycle description:	Manufacturing and Use		
Process description:	ESD describes the process of manufacturing different types of lubricants and fluids, including automotive crankcase lubricant, hydraulic fluid, and metal working fluid. (Appendix A)		
Number of sites:	In the United States around thirty companies produce lubricant additive chemicals, or packages of additives. These are sold to lube oil blending facilities. A few large companies both manufacture additives and blend them into oils. (pg. 13)		
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	The document is based on a report produced by the Building Research Establishment for the UK Environment Agency. The original purpose of the document was to provide information to be used in risk assessments for new and existing substances in the EU. Data are from OECD countries.
	Metric 3: Applicability	Medium	Data is for in-scope occupational scenarios; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Low	The completed exposure or risk assessment is more than 20 years old. The assessment captures operations, equipment, and worker activities 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	Uncertainty not addressed. Variability addressed by considering various types of lubricants and fluids.
Overall Quality Determination		Medium	

Study Citation:	OECD, (2009). Emission scenario document on plastic additives.		
HERO ID:	5079084		
Conditions of Use:	Processing- Plastics Compounding and Converting		
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 compoundind 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, (2020). Emission scenario document on chemical additives used in automotive lubricants.		
HERO ID:	6385735		
Conditions of Use:	Processing and Use - Formulation and Use of Automotive Lubricants		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	6.3 billion kg lubricants/yr		
Process description:	Processing: Unloading raw materials, blending, intermediate storage Use: Unloading lube oil, removing spend oil and replacing with new oil, disposing/recycling of used oil		
Throughput:	Provides methodology for estimating throughput based on the amount of lubricant produced, and the concentration of the chemical in the lube oil		
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 lubricant		
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 multiple in-scope occupational scenarios; 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 multiple additive types.
Overall Quality Determination		High	

Study Citation:	OECD, (2009). Emission scenario document on transport and storage of chemicals.		
HERO ID:	6393282		
Conditions of Use:	ProcessingTransportation and Storage		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	11 million tonnes shipped via rail tankers 30 million tonnes shipped via pipelines		
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:	Science Applications International Corporation, (1996). Generic scenario for automobile spray coating: Draft report.			
HERO ID:	6311222			
Conditions of Use:	Automotive Coating Application			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Auto OEM: 166,00 cars painted/yrAutorefinish: 70-2,000 L paints.yr			
Process description:	Pretreatment (wash) of car body, E-coat (dip), oven/cure, primer (spray), oven/cure, basecoat (spray), oven/cure, clearcoat (Spray), oven/cure			
Number of sites:	Auto OEM: 61 sitesAutorefinish: 1000's of sites			
Comments:	Auto OEM: 250 days/yrAutorefinish: 170 days/yr			
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	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 OEM and refinish applications.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2002). Flexographic ink options: A cleaner technologies substitutes assessment. Volume 1.			
HERO ID:	10293388			
Conditions of Use:	Use of flexographic inks			
EXTRACTION				
Parameter	Data			
Throughput:	p. 61Over 1000 companies, use more than 475 million lbs of ink per year			
Number of sites:	p.72 914 companies with flexography as primary printing process, 2300 establishments nationally that use flexographic printing			
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	The data are from the United States and are representative of the industry being evaluated.
	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 ink types.
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:	Use - Laboratory Chemicals			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Provides methodology to estimate annual use rate. Provides some use rate quantities for the first 10 chemicals in table 1-2			
Life cycle description:	Use - Laboratory Chemicals			
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:	260 days/yr 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, (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:	Section 3.4 presents the formula for determining annual repackaging rate, and section 3.5 for annual use rate for the chemical of interest.			
Life cycle description:	pg 4 of 116: Chemicals may be repackaged at any stage in their lifecycle. However, the scope of the generic scenario mainly applies to chemicals that go through a repackaging process after they are domestically manufactured or imported into the U.S. The general principals in this GS may be adapted for repackaging during other stages (e.g., after processing/formulation).			
Process description:	Details of the repackaging process is provided in section 2.0. Repackaging operations for liquid chemicals typically involve pouring or pumping the product from the original containers or mixing /storage tanks into the new containers.			
Throughput:	Section 3.5 provides formula for calculating the annual throughput			
Number of sites:	Section 3.7 provides formula for determining the number of sites			
Chemical concentration:	Section 3.3 provides formula for concentration of chemical of interest			
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
	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	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2021). Use of chemicals in fuels and related products - Generic scenario for estimating occupational exposures and environmental releases (Methodology review draft).		
HERO ID:	11203977		
Conditions of Use:	Use in Fuels and related Products		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	Formula for determining Annual production volume is in Section 3.7 (pg 19 of 76)		
Process description:	Section 2 provides the general process for the use of fuels and related products, including associated environmental release sources and occupational exposure activities. Liquified petroleum gas, gasoline, and diesel are stored and transported as liquids under moderate pressures until use/combustion (EPA, 2008). Fuels and related products may be transported with rail cars, tank trucks, marine vessels, or via pipeline (EPA, 2008). After transport to fuel service stations, fuels are typically stored in large storage tanks until transferred to vehicles or other equipment to be combusted to provide energy (EPA, 2008).		
Throughput:	Annual Throughput of Fuel per Site formula is provided in section 3.4.		
Number of sites:	Number of Use Sites formula is provided in section 3.7.		
Chemical concentration:	Concentration of the Chemical in Vapors formula is provided in section 3.9.		
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
	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	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized
Overall Quality Determination		High	

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:	Processing-plastic materials

EXTRACTION

Parameter	Data
Production, import, or use volume:	Table 1: Type of Thermoplastics, North American Production, And Common Uses. Not specific to o-DCB, however has plastic materials information.If the type of plastic is not known, the total amount of plastic resin produced in the U.S. should be used from Table 1 (35,012 million kg/yr). (P. 11.18)
Process description:	Thermoplastic polymers are melted and become fluid when heat and pressure are applied. The molten polymers are formed into a shape via pressure. Thermoplastics solidify when cooled and the heating and cooling process can be repeated many times with little loss in properties. This generic scenario focuses on thermoplastic polymers.Process Description:Polymer resin is received 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. Converting operations are not covered in this generic scenario, refer to Additives in Plastics Processing (Converting into Finished Products) generic scenario for information on converting operations.
Number of sites:	(715 establishments, 2001 County Business Patterns)

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. EPA generic scenario document.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States
	Metric 3: Applicability	Medium	The assessment is for an occupational scenario within the scope of the risk evaluation. Not Specific to oDCB.
	Metric 4: Temporal Representativeness	Medium	more than 10 years but no more than 20 years old.
	Metric 5: Sample Size	N/A	Process description
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:	U.S. EPA, (2000). Leather dyeing - Generic scenario for estimating occupational exposures and environmental releases (draft).			
HERO ID:	6311220			
Conditions of Use:	Leather dyeing			
EXTRACTION				
Parameter	Data			
Life cycle description:	Processing			
Process description:	Leather is generally dyed in wooden drums or rotating vessels. A dye bath is prepared by adding a dye stuff to the dyeing equipment; surfactants and other auxiliaries may also be added. The bath temperature may range from 0 to 60C. The leather is brought into the drum or rotating vessel, and the leather is dyed by gentle agitation for approximately 10 minutes. There are also semicontinuous processes ((multimac) dyeing machine) for leather dyeing.			
Throughput:	”annual amount of active colorant in the dyestuff solution used ranges from 200-2,500 kg/tannery, with an average use rate of 1,000 kg/tanneryThe total number of hides dyed at each facility typically averages 1,000 sides/day”			
Number of sites:	315 tanneries in the United States, and 80% perform dyeing operations. Number of sites calculated based on PV and should not exceed 252 tanneries.			
Chemical concentration:	Amount of active chemical in the formulated dyestuff (% active chemical of interest) is typically 50% for powdered dyes and 15% for liquid dyes (most dyes used in leather dyeing are acid dyes)			
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	Low	Assessment is based on data greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distributions characterized by ranges/estimations and some state 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 both liquid and solid physical forms and different leather types.
Overall Quality Determination			Medium	

Study Citation:	U.S. EPA, (2001). Manufacture and use of printing ink - Generic scenario for estimating occupational exposures and environmental releases (revised draft).		
HERO ID:	6311221		
Conditions of Use:	Industrial Use: Solvents (printing ink)		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	”The United States printing ink industry is a \$4.3 billion business, one-third of the world market (Ink World, 2001).” pg. 18/54		
Life cycle description:	”Inks currently manufactured include letterpress, lithographic, offset, gravure, and flexographic inks. Letterpress and lithographic inks are typically classified as paste inks. Gravure and flexographic inks are typically water or solvent-based and are classified as liquid inks” pg. 18/54pg. 21/54 provides percentage breakdown by application type		
Process description:	Section 3.1 (pg. 22/54) provides process description for ink manufacture. Section 3.2 (pg. 22/54) provides description of end use of inks which are further described in the subsections of 3.2 by process type.		
Throughput:	Table 4, pg. 28/54, provides production quantities by ink type		
Number of sites:	Table 4, pg. 28/54, provides number of sites by ink type		
Chemical concentration:	Table 5, pg. 29/54, provides concentration ranges by component		
Comments:	Note: This is not the most recent version of the Inks GS		
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 (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, 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	The data are from the United States and are representative of the industry being evaluated.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	The completed exposure or risk assessment is more 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	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 assessment provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination		High	

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:	All			
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		High		

Study Citation:	U.S. EPA, (1999). Flexographic printing - generic scenario for estimating occupational exposures and environmental releases: Draft.			
HERO ID:	6385709			
Conditions of Use:	Ink and Toners			
EXTRACTION				
Parameter	Data			
Process description:	ink received in drums, charged to ink chamber, flexogrpahic press, ink in substrate product			
Throughput:	1,800 kg ink/site-day			
Number of sites:	Provides methodology to estimate number of sites based on ink use rate and concentration of chemical in ink			
Chemical concentration:	1-10%, general additive concentration not chemical or function 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	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	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	U.S. EPA, (2004). Spray coatings in the furniture industry - generic scenario for estimating occupational exposures and environmental releases: Draft.			
HERO ID:	6385719			
Conditions of Use:	Furniture Coating Application			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	”Metal: 5,000-446,600 L coating/yrWood: 4,326-4,372 L coating/yr”			
Process description:	”Metal furniture: Metal cleaning, coating unloaded, coating mixing, coating application (spray booth, manual or automatic), flash-off, drying oven Wood furniture: coating unloaded, coating mixing, coating application (spray booth, manual or automatic), flash-off, drying oven, sanding and other finishing operations”			
Throughput:	”Metal: 20-1,786 L coating/dayWood: 17.3-17.4 L coating/day”			
Number of sites:	152-8,176			
Chemical concentration:	Provides conc. estimates based on chemical function, not chemical specific.			
Physical form:	liquid			
Comments:	250 days/yr			
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	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 wood vs metal furniture uses	
Overall Quality Determination		High		

Study Citation:	APR, (2020). U.S. post-consumer plastic recycling data.			
HERO ID:	11360400			
Conditions of Use:	Recycling			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	4.8 billion lbs of bottles, non-bottle rigid plastics, film and other plastics (excluding foam) were recovered for recycling in 2020.			
Life cycle description:	Recycling post-consumer plastics			
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	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	High	The report was published in 2020 and contains data from the past 10 years.
	Metric 5:	Sample Size	Low	Does not include statistical distribution of samples.
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, (2006). Toxicological profile for dichlorobenzenes.			
HERO ID:	5160103			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Production of 1,2-DCB in the United States fell from approximately 54 million pounds (24,700 metric tons) in 1975 to approximately 35 million pounds (15,800 metric tons) in 1993 (IARC 1999). The production volume of 1,2-DCB reported by manufacturers in 1998 was within the range of >50 million pounds to 100 million pounds (>23,000–45,000 metric tons) (EPA 2002e). In 2002, companies reported production within the range of <10 million pounds to 50 million pounds (<5,000–23,000 metric tons) (EPA 2002e). The historical rate of growth of this chemical from 1986–1995 was 0.7 percent per year (CMR 1996). The annual production capacity for the 1,2- isomer was 78 (35,000), 81 (37,000), 81 (37,000), 76 (34,000), 80 (36,000), 83 (38,000), and 33 (15,000) million pounds (metric tons) in 1983, 1988, 1995, 1997, 1999, 2001, and 2003 respectively.			
Number of sites:	1,4-DCB and 1,2-DCB are currently produced by 2 U.S. companies at 2 different locations: Solutia Inc., in Sauget, Illinois and PPG Industries, Inc., in Natrium, West Virginia (SRI 2005).			
Chemical concentration:	A maximum dichlorobenzene yield of 98% is obtainable in a batch process in which 2 moles of chlorine is used per mole of benzene (mass ratio approximately 1.8:1) in the presence of ferric chloride and sulfur monochloride (IARC 1999). 1,2- and 1,4- DCB are the major DCB isomers formed in this process, with 1,2:1,4 ratios dependant on the type of catalyst used (Table 5-1)			
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 (ATSDR report) 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	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The report captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The report is more than 10 yearsbut no more than 20 years old (2006).
	Metric 5:	Sample Size	N/A	N/A - information not dependent on samples
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	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized
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Study Citation:	ATSDR, (2006). Toxicological profile for dichlorobenzenes.		
HERO ID:	5160103		
Conditions of Use:	Manufacturing		
Domain	Metric	EVALUATION Rating	Comments
Overall Quality Determination		High	

Study Citation:	Bakoğlu, M., Karademir, A., Ayberk, S. (2004). An evaluation of the occupational health risks to workers in a hazardous waste incinerator. Journal of Occupational Health 46(2):156-164.			
HERO ID:	1441172			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Emission factors presented are related to PCDD/Fs35,000 t/y			
Process description:	Two-stage combustion system with a rotary kiln and a vertical shaft. Liquid waste is typically fed into the kiln in barrels			
Number of sites:	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	Medium	Data are from Turkey (OECD)
	Metric 3:	Applicability	High	CoU is in-scope (disposal)
	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 - Data not based on sampling
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:	Betts, W. D. (2000). Tar and pitch. :1-31.		
HERO ID:	8486216		
Conditions of Use:	Separation of ortho and para dichlorobenzene		
EXTRACTION			
Parameter	Data		
Process description:	"In the late 1980s, Brodie crystallizers were installed in the United Kingdom and in France for upgrading phthalic-grade naphthalene to 99% purity or better. This apparatus, developed by Union Carbide Corporation, Australia, for separating o- and p-dichlorobenzene, was adapted for naphthalene refining. The one installed in the United Kingdom, however, has been closed (21) (see Naphthalene)." pg. 12/31		
Comments:	Report is about refining tar, the only mention of o-DCB is that a crystallization process that was based on o-DCB/p-DCP separation was used in the tar industry. Report is otherwise not relevant to the COU's in scope for o-DCB		
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	Medium	The data are from an OECD country other than the U.S., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ processtechnologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	Uninformative	The report is 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	Report is over 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	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	The report provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination		Uninformative	

Study Citation:	Bonem, F. L. (1962). How two Maryland packers solve seasonal waste disposal problem. Food Processing 1962:34-36.			
HERO ID:	5251714			
Conditions of Use:	Use			
EXTRACTION				
Parameter	Data			
Life cycle description:	Solvent			
Process description:	o-DCB contained in Cloroben, a product dispersed in industrial waste to prevent odors, emulsify grease and fat, and control mosquito infestations			
Number of sites:	2			
Chemical concentration:	66%			
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 US
	Metric 3:	Applicability	High	Report discusses o-DCB use as a solvent/degreaser (in-scope)
	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 - Data not based on sampling
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:	Brown, S. L., Chan, F. Y., Jones, J. L., Liu, D. H., Mccaleb, K. E. (1975). Research program on hazard priority ranking of manufactured chemicals (Chemicals 21-40).			
HERO ID:	5251828			
Conditions of Use:	Manufacturing, Use			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	pg 165 of pdf - 62.4 million lbs/yr produced in US. 13.1 million lbs/yr used as TDI process solvent, 13.1 million lbs/yr used for other solvent uses			
Life cycle description:	Domestic manufacturing, Solvent use			
Number of sites:	11			
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 US
	Metric 3:	Applicability	High	Report discusses o-DCB manufacturing and use as a solvent/degreaser (in-scope)
	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 - Data not based on sampling
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:	Burgess, W. A. (1991). Potential exposures in the manufacturing industry—Their recognition and control. :595-674.				
HERO ID:	1267867				
Conditions of Use:	commercial use - in degreasers and in paints and coatings				
EXTRACTION					
Parameter	Data				
Process description:	Cold degreasing - a range of aliphatic and chlorinated hydrocarbons are used in immersion tanks with a vertical agitated perforated tray and a spray nozzle. The immersion tanks are provided with the necessary fire protection controls including a fusible link-actuated cover. Although immersion tanks and spray washing are widespread, the most common cold degreasing technique is the use of a small amount of solvent in a container that is taken into the plant for on-site use. Vapor phase degreasing – consists of a steel tank containing a quantity of solvent that is heated to its boiling point by steam or electricity. The solvent vapor rises and fills the tank to an elevation determined by the location of a condenser which in its simplest form is a cold-water coil or jacket. The vapor condenses and returns to the liquid sump. Units are designed for a specific solvent based on its boiling point, vapor density, and latent heat of vaporization. Individual workpiece or racks of small parts to be cleaned are lowered into the hot vapor, the vapor condenses on the cold parts and the surface oils and greases are dissolved by the solvent. In the industrial setting, paints can be applied to parts by a myriad of processes including brush, roller, dip, flow, curtain, tumbling, spray, and powder coating. Spray painting by air atomization is the most common application method encountered in industry and presents the principal hazards.				
EVALUATION					
Domain	Metric	Rating	Comments		
Domain 1: Reliability	Metric 1: Methodology	High	report uses high quality data		
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data provided is from various countries (not restricted to US)		
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.		
	Metric 4: Temporal Representativeness	Low	The report is more than 20 years old.		
	Metric 5: Sample Size	N/A	N/A - Data not based on sampling		
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	report clearly documents its data sources		
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A		
Overall Quality Determination		High			

Study Citation:	CDC, (2009). Fourth national report on human exposure to environmental chemicals.			
HERO ID:	664488			
Conditions of Use:	use			
EXTRACTION				
Parameter	Data			
Life cycle description:	The dichlorobenzenes are also chemical intermediates in synthesis of dyes, pesticides, and other industrial products.			
Chemical concentration:	o-DCB was not detected in blood in NHANES 2003-2004 and were detected in only less than 10% of the U.S. general population samples in earlier surveys			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	report uses high 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 report is for an occupational scenario within the scope 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	Low	characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
Overall Quality Determination			High	

Study Citation:	CEPE, (2020). SpERC fact sheet: Industrial application of coatings by spraying.			
HERO ID:	10442901			
Conditions of Use:	Paints and coatings			
EXTRACTION				
Parameter	Data			
Throughput:	Typical maximum daily usage, based on sector knowledge,1000 kg product/day at any one locationPigment/extender/filler - 100 kg/dayBinder - 100 kg/dayOrganic solvent/coalescent - 450 kg/dayAdditives - 5 kg/day			
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	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation but data is general and not chemical specific.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	N/A	characterized by a maximum with uncertain 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	Medium	Variability is addressed by including throughput for different substance functions but uncertainty is not addressed.
Overall Quality Determination			High	

Study Citation:	CEPE, (2020). SpERC fact sheet: Professional application of coatings and inks by spraying.			
HERO ID:	10442902			
Conditions of Use:	Paints and coatings, Ink, toner, and colorant products			
EXTRACTION				
Parameter	Data			
Throughput:	Typical maximum daily usage, based on sector knowledge,100 kg product/day at any one locationPigment/extender/filler - 10 kg/dayBinder - 10 kg/dayOrganic solvent/coalescent - 45 kg/dayAdditives - 0.50 kg/day			
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	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	Medium	The report is for occupational scenarios within the scope of the risk evaluation but data is general and not specific to the chemical.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Medium	characterized by a maximum with uncertain 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	Medium	Variability is addressed by including throughput for different substance functions but uncertainty is not addressed.
Overall Quality Determination			High	

Study Citation:	Citgo, (1992). Initial submission: Letter from Citgo Petro Corp to USEPA regarding studies with petroleum products with attachments and cover letter dated 042792.			
HERO ID:	5264616			
Conditions of Use:	Use			
EXTRACTION				
Parameter	Data			
Life cycle description:	Solvent in petroleum products			
Chemical concentration:	o-DCB contained at 20-50%			
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	Data are from the US
	Metric 3:	Applicability	Medium	Use is not in scope (solvent for petroleum products) but may be useful for in-scope solvent uses for o-DCB
	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 - Data not based on sampling
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:	Company Withheld (2024). o-Dichlorobenzene: Occupational inhalation exposure assessment results summary (redacted).			
HERO ID:	13171505			
Conditions of Use:	Industrial Use of Solvents			
EXTRACTION				
Parameter	Data			
Process description:	Connect and disconnect transfer hoses to an intermodal container, replace melt filter, office/routine duties, pump work, fan work.			
Chemical concentration:	100% (pg.12)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses NIOSH 1003.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Report is for Industrial use of Solvents, an in-scope OES.	
	Metric 4: Temporal Representativeness	High	Report is from 2024.	
	Metric 5: Sample Size	Low	Concentration of o-DCB is presented as a single value with no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Report clearly documents methods and data.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty is addressed via the sampling methods. Variability in concentration isn't addressed.	
Overall Quality Determination		High		

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			
Number of sites:		As of December 1991, there were only approximately 150 permitted and operating sites. In addition, as of 1990 there were approximately 30 mobile or trans-portable incinerator units			
EVALUATION					
Domain		Metric		Rating	Comments
Domain 1: Reliability		Metric 1:	Methodology	High	Sources for release data are trustworthy. EPA report.
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	In scope
		Metric 4:	Temporal Representativeness	Low	Data from 1990, older than 20 years
		Metric 5:	Sample Size	N/A	N/A - information not dependent on samples
Domain 3: Accessibility/ Clarity		Metric 6:	Metadata Completeness	Medium	Metadata given, but release frequency not provided
Domain 4: Variability and Uncertainty		Metric 7:	Metadata Completeness	Medium	Variability between different incinerator types is discussed, but no discussion of uncer-tainty
Overall Quality Determination				High	

Study Citation:	Deng, Y., Bonilla, M., Ren, H., Zhang, Y. (2018). Health risk assessment of reclaimed wastewater: A case study of a conventional water reclamation plant in Nanjing, China. Environment International 112:235-242.			
HERO ID:	4728647			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Chemical concentration:	Discharge standard for o-DCB from wastewater treatment units is 4 x 10^5 mg/L			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Methodology	High	report uses high quality data
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	The data are from a non-OECD country
	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	characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or uncertainty.
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			
Production, import, or use volume:	No production volume data provided.			
Number of sites:	Number of sites reporting releases 2012-2018 in the following areas: Port Arthur, TX Area: 22 sites; Houston, TX Area: 56 sites; Mossville, LA Area: 6 sites; Cancer Alley Area: 22 sites			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data 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 evaluated.	
	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 captures operations, equipment, and worker activities expected to be representative of current conditions. The report is generally no more than 10 years old.	
	Metric 5: Sample Size	High	Discrete data points provided.	
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 accounted for through investigation of various high throughput regions. However, uncertainty of releases is not addressed.	
Overall Quality Determination		High		

Study Citation:	ENF, (2024). Plastic recycling plants in the United States.			
HERO ID:	11360395			
Conditions of Use:	Plastics Recycling			
EXTRACTION				
Parameter	Data			
Number of sites:	59 plastic recycling plants based in United States process plastic waste into new materials. (pg. 1)			
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	The data are from the United States and are representative of the industry being evalu- ated.
	Metric 3:	Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation. How- ever, this report is not chemical specific.
	Metric 4:	Temporal Representativeness	High	The report was published in 2024.
	Metric 5:	Sample Size	Low	The distribution of samples is not characterized by any statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Report provides results, but the underlying data sources are not described.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The report does not address variability or 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:	Plastics compounding/converting			
EXTRACTION				
Parameter	Data			
Process description:	”Solid and foamed plastic products are manufactured by a variety of methods. The choice of manufacturing techniques used to process a plastic product depends largely on whether the resin is a thermoplastic or thermoset, and the dimensions, shape, or physical qualities of the desired product. This section describes the major manufacturing techniques used to fabricate intermediate and final plastic products. Extrusion is the most widely used processing technique, followed by injection molding, blow molding, and foam processing (Midwest Research Institute, 1993). These four manufacturing techniques, in addition to lamination, coating, and finishing operations, are described below” p. 11			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data that are from frequently used sources 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	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Low	The report is more than 20 years old. The report captures operations, equipment, and worker activities that are expected to be outdated.	
	Metric 5: Sample Size	N/A	This data is not dependent on sampling	
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		High		

Study Citation:	Fishbein, L. (1979). Potential halogenated industrial carcinogenic and mutagenic chemicals. IV. Halogenated aryl derivatives. Science of the Total Environment 11(3):259-278.
HERO ID:	659539
Conditions of Use:	Manufacturing, Use

EXTRACTION

Parameter	Data
Production, import, or use volume:	The estimated U.S. Consumption pattern for ortho-dichlorobenzene in 1975 was: 65% in organic synthesis (mainly for 3,4-dichloroaniline); 15% as a toluene diisocyanate process solvent; 10% for miscellaneous solvent usage (e.g., paint removers, engine cleaners, and de-inking solvents); 5% in dye manufacture; and 5% for miscellaneous uses. ortho-Dichlorobenzene is also used to manufacture three dyes: C. I. Mordant Red 27, C. I. Direct Blue 108, and C. I. Direct Violet 54. Additional uses include: as a pesticide, in degreasing agents, in wood preserving compounds, as a heat-exchange medium and in an emulsifiable form for deodorizing garbage and sewage. U.S. production of ortho-dichlorobenzene in 1972 was 28 million kg and in 1973 it was predicted to be between 32–41 million kg [4]. Although combined production of ortho- and para-dichlorobenzene in western Europe in 1972 was estimated to have been approximately 30 million kg, it was not known how much was ortho-dichlorobenzene,
Life cycle description:	Manufacturing, Solvent in chemical manufacturing, dye manufacturing, degreasing
Process description:	Mixtures of the dichlorobenzenes can be produced by chlorination of chlorobenzene at 150–190°C in the presence of ferric chloride. The two principal dichlorobenzenes in the residue or in the mixture can be separated by fractional distillation or by crystallization of the para-isomer. When chlorinated in the presence of aluminium analogs chlorobenzene yields a mixture of o- and p-dichlorobenzenes plus a very small amount of the meta-isomer
Chemical concentration:	A technical-grade of ortho dichlorobenzene available in the U.S.A. typically contains 98.7% by weight of the orthoisomer and 1.3% of the meta- and para-isomers combined. Other grades of ortho-dichlorobenzenes are also available, e.g., one typically contains 83% of the ortho-isomer, and 17% of the meta- and para-isomers combined.

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 - information not dependent on samples
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 for PV between years, but uncertainty is not addressed.

Overall Quality Determination**High**

Study Citation:	Heitbrink, W. (1993). In-depth survey report: Control technology for autobody repair and painting shops at Team Chevrolet, Colorado Springs, Colorado.			
HERO ID:	6558535			
Conditions of Use:	commercial use-auto paint shop			
EXTRACTION				
Parameter	Data			
Process description:	Process description of auto paint shop is presented. o-DCB is used in paints and hence teh relevancy though no particular reference has been made to o-DCB. The application involves a primer, base coat, and a clear coat. Typ1cally, the base coat contains colored pigments and carrier solvents. A clear coat is applied over the base coat. The clear coat is composed of two components - a clear coat and a hardener.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	report presents accurate info
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US data
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	information is greater than 20 years old
	Metric 5:	Sample Size	N/A	N/A - information not dependent on samples
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	N/A	N/A - information not dependent on metada
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - information not dependent on metada
Overall Quality Determination		High		

Study Citation:	Heitbrink, W., Cooper, T., Edmonds, M., Bryant, C., Ruch, W. (1993). In-depth survey report: control technology for autobody repair and painting shops at Valley Paint and Body Shop, Amelia, Ohio.			
HERO ID:	6558536			
Conditions of Use:	Painting and Coating			
EXTRACTION				
Parameter	Data			
Process description:	Though o-DCB was not mentioned in this article, i-DCB is typically used in coatings and paints. The spray painting booth has two painting cycles. During the painting cycle, outside air is passed through a series of filters. The final set of filters cover the entire ceiling of the spray painting booth. A nominal 12,000 cubic feet per minute of air flows out of the ceiling around the car or object being painted and out of the booth through exhaust grates located in the floor of the booth. The booth is 23 feet long, 13 feet wide and 9 feet high. The air is exhausted through a 2-foot wide, rectangular slot in the floor that is 17 feet by 6 feet. After the car or body part has been painted, the worker leaves the booth and the paint is cured at a temperature between 120 and 140°F. During this period, the airflow in the booth is reduced and about 80 percent of the air flow in the booth is recycled. In this shop, spray painting is performed using gravity-fed, HVLP spray painting guns (SATA, Ludwigsburg, Germany). In these guns, gravity causes paint to flow into the orifice where atomization occurs. The air pressure at this point is less than 10 psi. Reportedly, the HVLP spray guns are much more efficient at transferring the paint from the gun to the car than the other types of spray painting guns. In this shop, most painting jobs involve the application of a primer, base coat, and a clear coat. Typically, the base coat contains colored pigments and carrier solvents.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	report presents high quality data	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	US data	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Low	The report is more than 20 years old.	
	Metric 5: Sample Size	N/A	N/A - information not dependent on samples	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	N/A	N/A - information not dependent on metadata	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A - information not dependent on metadata	
Overall Quality Determination	High			

Study Citation:	IARC, (1999). Hexachlorobutadiene. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, vol. 73 73:277-294.
HERO ID:	18474
Conditions of Use:	Manufacturing, Use

EXTRACTION	
Parameter	Data
Production, import, or use volume:	Total combined production of chlorobenzenes amounted to approximately 400 thousand tonnes in 1988, with 46% in the United States, 34% in western Europe and 20% in Japan; monochlorobenzene accounted for over 50% of the total production of chlorinated benzenes (Bryant, 1993). Production of ortho-dichlorobenzene in the United States has decreased since the 1970s, from approximately 24 700 tonnes in 1975 to approximately 15 800 tonnes in 1993 (International Trade Commission, 1993; Environmental Protection Agency, 1998a).
Life cycle description:	Manufacturing, Intermediate
Process description:	"Chlorobenzenes are prepared industrially by reaction of liquid benzene with gaseous chlorine in the presence of a catalyst at moderate temperature and atmospheric pressure. Hydrogen chloride is formed as a by-product. Generally, mixtures of isomers and compounds with varying degrees of chlorination are obtained. Lewis acids (FeCl ₃ , AlCl ₃ , SbCl ₃ , MnCl ₂ , MoCl ₃ , SnCl ₄ , TiCl ₄) are the main catalysts used (Beck, 1986). Dichlorobenzenes are formed in this process as isomeric mixtures with a low content of the 1,3-isomer. A maximum dichlorobenzene yield of 98% is obtainable in a batch process in which 2 mol of chlorine per mol of benzene are reacted in the presence of ferric chloride and sulfur monochloride at mild temperatures. The remainder of the product consists of mono- and trichlorobenzene. About 75% para-dichlorobenzene, 25% ortho-dichlorobenzene and only 0.2% meta-dichlorobenzene are obtained (Beck, 1986). In western Europe and the United States, ortho-dichlorobenzene is used mainly in the production of 3,4-dichloroaniline, the base material for several herbicides; in Japan it is used for garbage treatment (Bryant, 1993). The estimated pattern of use of ortho-dichlorobenzene in the United States in 1987 was: organic synthesis (mainly for herbicides), 90%; toluene diisocyanate processing solvent, 5%; and miscellaneous uses, 5% (Environmental Protection Agency, 1998a). ortho-Dichlorobenzene is also used as a solvent for waxes, gums, resins, tars, rubbers, oils and asphalts; as an insecticide for termites and locust borers; as a degreasing agent for metals, leather, paper, dry-cleaning, bricks, upholstery and wool; as an ingredient of metal polishes; in motor oil additive formulations; and in paints (National Toxicology Program, 1991b; Budavari, 1996; Environmental Protection Agency, 1998b)."
Chemical concentration:	Technical-grade ortho-dichlorobenzene typically consists of 70–85% ortho-dichlorobenzene, < 0.05% chlorobenzene and < 0.5% trichlorobenzene, with the remainder as meta- and para-dichlorobenzene. Pure-grade ortho-dichlorobenzene consists of > 99.8% ortho-dichlorobenzene, < 0.05% chlorobenzene, < 0.1% trichlorobenzene and < 0.1% para-dichlorobenzene.
Comments:	Source is a copy of 666726

		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	N/A	N/A - PV and market data not based on sampling
Domain 3: Accessibility/ Clarity			
	Metric 6: Metadata Completeness	High	Results and sources for data are clearly described
Domain 4: Variability and Uncertainty			

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General Engineering Assessment

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Study Citation:	IARC, (1999). Hexachlorobutadiene. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, vol. 73 73:277-294.		
HERO ID:	18474		
Conditions of Use:	Manufacturing, Use		
Domain		EVALUATION	
Metric		Rating	Comments
Metric 7:	Metadata Completeness	Medium	Variability addressed between years, but not uncertainty
Overall Quality Determination		High	

Study Citation:	IARC, (1982). IARC monographs on the evaluation of the carcinogenic risk of chemicals to humans: Some industrial chemicals and dyestuffs. IARC monographs on the evaluation of carcinogenic risks to humans 29:1-398.
HERO ID:	27010
Conditions of Use:	Manufacturing

EXTRACTION	
Parameter	Data
Production, import, or use volume:	"26 million kg (domestic manufacturing in 1979 with an additional producer with undisclosed product amount producing mixtures of o- and p-dichlorobenzenes); (1979): 5.9 million kg; US import: 913 kg (1979), 403,000 kg (1976) US export: 17.3 million kg (1980, all dichlorobenzenes) Source also has production information for European countries and Japan. Use of ortho-dichlorobenzene in the US in 1978 is estimated to have been as follows: organic synthesis (mainly for production of 3,4-dichloroaniline), 70%; solvents for toluene diisocyanate production, 15%; miscellaneous solvent usage, 8%; dye manufacture, 4%; and other applications, 3%. The estimated 13 million kg of ortho-dichlorobenzene used in Japan in 1979 was distributed as follows: disinfectant, 40%; pesticide intermediate, 30%; toluene diisocyanate process solvent, 23%; and other uses, 7%. The principal use of ortho-dichlorobenzene in western Europe is as a chemical intermediate in the production of 3,4-dichloroaniline. "
Life cycle description:	The principal derivative of ortho-dichlorobenzene is 3,4-dichloroaniline, a key intermediate in the production of herbicides; ortho-dichlorobenzene is used to produce toluene diisocyanates, which is used to make flexible foams, and other polyurethane resin and elastomer products; a solvent in the following applications: motor-oil additive formulations; paints; formulations for removing paints, greases, gums, tars, etc; engine cleaning compounds (to remove lead and carbon deposits); shoe, metal and other polishes; firearm cleaners; rust preventatives; dissolution of pitch on papermaking felts; removal of grease from leather hides and woollen pelts; and as a carrier for wood preservatives and repellents, used in emulsion combinations with cresylic acid for degreasing; shoe dyes as a penetrant; and upper cylinder lubricants, reaction medium for the manufacture of three dyes; heat transfer fluid.
Process description:	o-DCB is now produced commercially by the direct chlorination of benzene in the liquid phase in the presence of a Friedel-Crafts catalyst (usually ferric chloride) and fractionation of the resulting mixture of chlorinated benzenes
Number of sites:	4 manufacturers in US. Also information for manufacturers in European countries
Chemical concentration:	"Specifications for the high-purity grade are: 98.0% minimum active ingredient. Technical grade are: 80-90% active ingredient"

EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Data from reliable sources (U.S.international trade commission, department of commerce)
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 - PV and market data not based on sampling
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty			

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Study Citation:	IARC, (1982). IARC monographs on the evaluation of the carcinogenic risk of chemicals to humans: Some industrial chemicals and dyestuffs. IARC monographs on the evaluation of carcinogenic risks to humans 29:1-398.		
HERO ID:	27010		
Conditions of Use:	Manufacturing		
Domain		EVALUATION	
Metric		Rating	Comments
Metric 7:	Metadata Completeness	Medium	variability addressed with multiple years PV data and uncertainty not addressed
Overall Quality Determination		High	

Study Citation:	IARC, (1982). Ortho- and para-dichlorobenzenes. IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans, vol. 29:213-238.			
HERO ID:	4912310			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	”26 million kg (domestic manufacturing in 1979) US import: 913 kg (1979), 403,000 kg (1976) US export: 17.3 million kg (1980, all dichlorobenzenes) Source also has production information for European countries Use of ortho-dichlorobenzene in the US in 1978 is estimated to have been as follows: organic synthesis (mainly for production of 3,4-dichloroaniline), 70%; solvents for toluene diisocyanate production, 15%; miscellaneous solvent usage, 8%; dye manufacture, 4%; and other applications, 3%. The estimated 13 million kg of ortho-dichlorobenzene used in Japan in 1979 was distributed as follows: disinfectant, 40%; pesticide intermediate, 30%; toluene diisocyanate process solvent, 23%; and other uses, 7%. The principal use of ortho-dichlorobenzene in western Europe is as a chemical intermediate in the production of 3,4-dichloroaniline. ”			
Process description:	o-DCB is now produced commercially by the direct chlorination of benzene in the liquid phase in the presence of a Friedel-Crafts catalyst (usually ferric chloride) and fractionation of the resulting mixture of chlorinated benzenes			
Number of sites:	4 manufacturers in US. Also information for manufacturers in European countries			
Comments:	This source is identical to HERO ID 27010			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Data from reliable sources (U.S.international trade commission, department of commerce)	
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	Medium	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 - PV and market data not based on sampling	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	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 with multiple years PV data and uncertainty not addressed	
Overall Quality Determination		High		

Study Citation:	IARC, (1999). Some chemicals that cause tumours of the kidney or urinary bladder in rodents and some other substances.			
HERO ID:	666726			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Number of sites:	3 Mfg plants			
Comments:	TWA, PBZ			
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	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	Report from 1999 (after the PEL but more than 20 years ago)
	Metric 5:	Sample Size	N/A	N/A - data is no dependent of sample
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	N/A	N/A - data is no dependent of sample
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - data is no dependent of sample
Overall Quality Determination			High	

Study Citation:	IARC, (1999). Some chemicals that cause tumours of the kidney or urinary bladder in rodents and some other substances.			
HERO ID:	666726			
Conditions of Use:	Manufacturing, Use			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Total combined production of chlorobenzenes amounted to approximately 400 thousand tonnes in 1988, with 46% in the United States, 34% in western Europe and 20% in Japan; monochlorobenzene accounted for over 50% of the total production of chlorinated benzenes (Bryant, 1993). Production of ortho-dichlorobenzene in the United States has decreased since the 1970s, from approximately 24 700 tonnes in 1975 to approximately 15 800 tonnes in 1993 (International Trade Commission, 1993; Environmental Protection Agency, 1998a).			
Life cycle description:	Manufacturing, Intermediate			
Process description:	”Chlorobenzenes are prepared industrially by reaction of liquid benzene with gaseous chlorine in the presence of a catalyst at moderate temperature and atmospheric pressure. Hydrogen chloride is formed as a by-product. Generally, mixtures of isomers and compounds with varying degrees of chlorination are obtained. Lewis acids (FeCl3, AlCl3, SbCl3, MnCl2, MoCl3, SnCl4, TiCl4) are the main catalysts used (Beck, 1986). Dichlorobenzenes are formed in this process as isomeric mixtures with a low content of the 1,3-isomer. A maximum dichlorobenzene yield of 98% is obtainable in a batch process in which 2 mol of chlorine per mol of benzene are reacted in the presence of ferric chloride and sulfur monochloride at mild temperatures. The remainder of the product consists of mono- and trichlorobenzene. About 75% para-dichlorobenzene, 25% ortho-dichlorobenzene and only 0.2% meta-dichlorobenzene are obtained (Beck, 1986). In western Europe and the United States, ortho-dichlorobenzene is used mainly in the production of 3,4-dichloroaniline, the base material for several herbicides; in Japan it is used for garbage treatment (Bryant, 1993). The estimated pattern of use of ortho-dichlorobenzene in the United States in 1987 was: organic synthesis (mainly for herbicides), 90%; toluene diisocyanate processing solvent, 5%; and miscellaneous uses, 5% (Environmental Protection Agency, 1998a). ortho-Dichlorobenzene is also used as a solvent for waxes, gums, resins, tars, rubbers, oils and asphalt; as an insecticide for termites and locust borers; as a degreasing agent for metals, leather, paper, dry-cleaning, bricks, upholstery and wool; as an ingredient of metal polishes; in motor oil additive formulations; and in paints (National Toxicology Program, 1991b; Budavari, 1996; Environmental Protection Agency, 1998b).”			
Chemical concentration:	Technical-grade ortho-dichlorobenzene typically consists of 70–85% ortho-dichlorobenzene, < 0.05% chlorobenzene and < 0.5% trichlorobenzene, with the remainder as meta- and para-dichlorobenzene. Pure-grade ortho-dichlorobenzene consists of > 99.8% ortho-dichlorobenzene, < 0.05% chlorobenzene, < 0.1% trichlorobenzene and < 0.1% para-dichlorobenzene.			
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	N/A	N/A - PV and market data not based on sampling
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Results and sources for data are clearly described
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed between years, but not uncertainty
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Study Citation:	IARC, (1999). Some chemicals that cause tumours of the kidney or urinary bladder in rodents and some other substances.		
HERO ID:	666726		
Conditions of Use:	Manufacturing, Use		
Domain	Metric	EVALUATION Rating	Comments
Overall Quality Determination		High	

Study Citation:	IPCS, (1991). Chlorobenzenes other than hexachlorobenzene.			
HERO ID:	81628			
Conditions of Use:	Domestic manufacture			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Estimated US production of 22 x 10^6 kg in 1980			
Life cycle description:	Domestic manufacture			
Process description:	Monochlorobenzene and the dichlorobenzenes are produced commercially by the direct chlorination of benzene in the liquid phase, in the presence of a Lewis acid catalyst, such as ferric chloride. In the liquid-phase chlorination of monochlorobenzene, 1,2-, and 1,4-dichlorobenzenes are the predominant products.			
Chemical concentration:	technical 1,2-DCB may contain up to 19 % of the other DCBs, 1 % TCBs, and up to 0.05 % MCB			
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	N/A	N/A - PV and market data not based on sampling
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Data sources are clearly documented but underlying methodologies and assumptions are not provided
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination		Medium		

Study Citation:	Krishnamurti, R. (2001). Chlorinated benzenes.		
HERO ID:	5177139		
Conditions of Use:	Manufacture		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	About 11,400 t were consumed in 1988 p.11		
Life cycle description:	"o-Dichlorobenzene is consumed for 3,4-dichloroaniline, the base material for several herbicides, in the United States and Western Europe and is emulsified in Japan for garbage treatment." (p.10)"The principal use of o-dichlorobenzene in the United States is the manufacture of 3,4-dichloroaniline [95-76-1], a raw material used in the production of herbicides, although recent developments in the marketplace suggest that this application is likely to see lowered demand. A small amount of 3,4-dichloroaniline is used to produce 3,4,40 -trichlorocarbaniide [101-20-2] (TCC) used as a bacteriostat in deodorant soaps." p. 13		
Process description:	"The production of any chlorinated benzene is a multiple-product operation. Plants for chlorobenzene must produce HCl and some other chlorinated benzenes. Only limited control can be exercised over the product ratios. Chlorinated benzenes can be produced by the vapor-phase chlorination of benzene using air and HCl as chlorinating agents. This was the first stage of the Raschig phenolprocess (7,8). The energy costs are so high, this process could never have been considered in the past to commercially produce chlorobenzenes as main products. Chlorine and benzene react in the vapor phase at 400 to 5008C to give a different distribution of products (12), but such a process is much more costly than conventional liquid-phase operations. All of the chlorobenzenes are now produced by chlorination of benzene in the liquid phase. Ferric chloride is the most common catalyst. Although precautions are taken to keep water out of the system, it is possible that theFeCl3 H2O complex catalyst is present in most operations owing to traces of moisture in benzene entering the reactor. This FeCl3 H2O complex is probably the most effective catalyst (13)." p. 3"The split between para and ortho is currentlyaround three parts para to one part ortho. " p. 10"Mixtures of orthodichlorobenzene and chlorinated olefinsreact with aluminum, leading to catastrophic failure of aluminum tanks containing such a mixture. 1,4-Dichlorobenzene is shipped either in molten form in insulated steel tank cars with heater coils, or as flake or granular solid in suitably sealed containers, such as paper bags, fiber packs, or drums. " p.7		
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 (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	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	The report is more than 20 years old. The report captures operations, equipment, and worker activities that are expected to be outdated.
	Metric 5: Sample Size	N/A	No sampling occurred in this report
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			
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o-Dichlorobenzene

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HERO ID: 5177139 Table: 1 of 1

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Study Citation:		Krishnamurti, R. (2001). Chlorinated benzenes.		
HERO ID:		5177139		
Conditions of Use:		Manufacture		
Domain		Metric	EVALUATION	
			Rating	Comments
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:	Lim, H. H., Shin, H. S. (2017). Sensitive Determination of Volatile Organic Compounds and Aldehydes in Tattoo Inks. Journal of Chromatographic Science 55(2):109-116.			
HERO ID:	3491065			
Conditions of Use:	Commercial Use			
EXTRACTION				
Parameter	Data			
Life cycle description:	Ink (for tattoos)			
Chemical concentration:	0.07–10.6 mg/kg			
Physical form:	liquid			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	Methods are well-documented and assumed to be accurate	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	South Korea (OECD)	
	Metric 3: Applicability	Uninformative	CoU is out of scope and tattoo inks are not covered under TSCA.	
	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 ranges provided with statistics	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Methodology and assumptions are clearly documented	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.	
Overall Quality Determination		Uninformative		

Study Citation:	Liu, W., Zheng, M., Wang, D., Xing, Y., Zhao, X., Ma, X., Qian, Y. (2004). Formation of PCDD/Fs and PCBs in the process of production of 1,4-dichlorobenzene. Chemosphere 57(10):1317-1323.			
HERO ID:	2161460			
Conditions of Use:	Manufacture			
EXTRACTION				
Parameter	Data			
Process description:	Report discusses process to produce p-DCB, which involves production of o-DCB. Figure 1 shows the process: chlorobenzene is chlorinated and purified in multiple steps to produce a mixture of p-DCB and o-DCB, which are seperated through distillation and crystallization.			
Number of sites:	1			
Chemical concentration:	100% o-DCB in sample obtained			
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	China (Non-OECD)
	Metric 3:	Applicability	High	CoU is in-scope (manufacturing)
	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 - Data not based on sampling
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Methodology 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:	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:	Manufacture			
EXTRACTION				
Parameter	Data			
Life cycle description:	It is used as a solvent for waxes, oils, and asphalts, as a metal degreasing agent, and as. an insecticide for termites and locust borerspg. 73/120			
Process description:	1,2-Dichlorobenzene can be produced by chlorinating chlorobenzene in the presence of ferric chloridepg. 73/120			
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 (e.g., European Union or OECD reports, NIOSH HHES, journal articles, 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	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	High	High: The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The report is 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	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 report does not address variability or uncertainty.
Overall Quality Determination			Medium	

Study Citation:	Marshall, K. A., Pottenger, L. H. (2016). Chlorocarbons and chlorohydrocarbons. :1-29.			
HERO ID:	3828879			
Conditions of Use:	manufacturing			
EXTRACTION				
Parameter	Data			
Life cycle description:	o-DCB is primarily used for organic synthesis, especially in the production of 3,4-dichloroaniline herbicides. It is used as a process solvent in the production of isocyanates and for working with fullerenes. It is also used as a solvent in engine cleaners and paint removers.			
Process description:	Continuous chlorination of benzene at 30–50 degC in the presence of a Lewis acid typically yields 85% monochlorobenzene. Temperatures in the range of 150–190 degC favor production of the dichlorobenzene products. The p-DCB is produced in a ratio of 2–3:1 of the o-DCB. Other methods of aromatic ring chlorination include use of a mixture of hydrogen chloride and air in the presence of a copper–salt catalyst or sulfuryl chloride in the presence of aluminum chloride at ambient temperature.			
Throughput:	Chlorobenzene accounts for over 70% of chlorinated aromatic use in the world. The remaining demand is primarily for o- and p-dichlorobenzene.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	report uses high quality data	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	data are from the United States	
	Metric 3: Applicability	High	report is for an occupational scenario within the scope of the risk evaluation	
	Metric 4: Temporal Representativeness	Medium	The report captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions.	
	Metric 5: Sample Size	N/A	N/A - information not dependent on samples	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	report clearly documents its data sources	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.	
Overall Quality Determination		High		

Study Citation:	Milbrandt, A., Coney, K., Badgett, A., Beckham, G. T. (2022). Quantification and evaluation of plastic waste in the United States. Resources, Conservation and Recycling 183:106363.			
HERO ID:	11360398			
Conditions of Use:	Recycling			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Of the estimated 44 Mt of plastic waste managed in 2019 domestically, approximately 86% was landfilled, 9% was combusted, and 5% was recycled. (pg. 1)			
Life cycle description:	Recycling			
Throughput:	Table 3 describes the landfilled amount of plastic waste in 2019 for various plastic material types by resin. (pg. 5)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	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, but is not chemical specific.	
	Metric 4: Temporal Representativeness	High	The report was published in 2022 which is less than 10 years old.	
	Metric 5: Sample Size	Medium	Sample size is sufficiently representative. However, the statistical distribution is not fully characterized.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	The report clearly documents its data sources, assessment methods, results, and assumptions.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The report addresses variability through ranges, but does not address uncertainty.	
Overall Quality Determination		High		

Study Citation:	Monsanto Chemical Company, (1995). Whole effluent and chemical specific evaluation (o-dichlorobenzene) of Monsanto’s Antwerp plant aqueous discharge, with cover letter dated 07/10/95.			
HERO ID:	2048254			
Conditions of Use:	Disposal			
EXTRACTION				
Parameter	Data			
Chemical concentration:	Wastewater effluent was monitored for o-DCB but was found to be beneath the detection limit.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The data is known or expected to be accurate and is known to cover all release sources at the site.y.	
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	Low	The data were collected before the most recent federal regulatory action or update or are more than 20 years old if no federal regulation is established.	
	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	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	The report provides only limited discussion of the variability and uncertainty in the results.	
Overall Quality Determination		High		

Study Citation:	(1994). Locating and Estimating Air Emissions from Sources of Chlorobenzenes (Revised March 1994).
HERO ID:	1998192
Conditions of Use:	Manufacturing, Processing as a Reactant, Dyes and Pigments, Use of Synthetic Dye and Pigments, Use of o-DCB as a processing solvent or reaction media, Disposal
EXTRACTION	
Parameter	Data
Production, import, or use volume:	Currently, three facilities have the capacity to produce both o- and p-dichlorobenzene. Annual capacity of o-dichlorobenzene is 36.7 million kilograms (80.9 million pounds) (p.48)
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Study Citation:	(1994). Locating and Estimating Air Emissions from Sources of Chlorobenzenes (Revised March 1994).
HERO ID:	1998192
Conditions of Use:	Manufacturing, Processing as a Reactant, Dyes and Pigments, Use of Synthetic Dye and Pigments, Use of o-DCB as a processing solvent or reaction media, Disposal

EVALUATION			
Domain	Metric	Rating	Comments
Process description:			Mfg: "The residue from distillation of crude chlorobenzene, consisting mainly of o- and p-DCB, is the principal source of these isomers. Figure 4-2 presents basic operations that may be used to produce o- and p-DCB and TCB. In a continuation of the production of MCB, o- and p-DCB can be separated by fractional distillation. Isomer fractionation yields p-DCB (with traces of o-DCB and m-DCB) which enters the overhead (Stream 1) while the o-DCB enters the bottoms (Stream 2). The o-DCB bottoms (Stream 2) undergoes fractional distillation and produces an oDCB overhead (Stream 3), which is sent to storage, and bottoms (Stream 4), which is further processed to yield TCBs." (p. 48) Uses: "Commercially, 3,4-dichloroaniline is prepared by the nitration of o-DCB followed by reduction of the resulting 3,4-dichloronitrobenzene. In many cases, the nitration operation produces two immiscible layers. For safety reasons and ease of operation, temperatures from 0°C to 120°C (32°F to 248°F) and atmospheric pressure are used. At higher temperatures, competing oxidation reactions become important. Reaction residence times for nitration range from 1 to 60 minutes." (p. 63) "The manufacture of commercial toluene diisocyanates is based on the phosgenation of primary amines. Most commercial TDI plants also produce the intermediates dinitrotoluene (DNT), toluene diamine (TDA) and phosgene. o-DCB or m-DCB are often used as solvents" (p. 70) "Ortho-dichlorobenzene is used as a process solvent in the production of two oxazine pigments, one pyranthrone dye, and one anthraquinone dye. In addition, these dyes may be used to produce other related dyes and pigments by halogenation. The manufacture of the oxazine pigments involves the condensation of substituted aniline compounds with a substituted phenolic compound (or a phenol ether), followed by an oxidative reaction which forms the oxazine ring system. Stirred batch reactors with glass linings are required for most of the reactions involved in making these products. The oxazine pigment (C.I. 51319) is produced by condensing chloranil with 3-amino-9-ethylcarbazole using sodium acetate as a catalyst. Ortho-dichlorobenzene is used as the process solvent in the reaction which requires 7 hours at 60° to 115°C (140° to 239°F). The condensation product is cyclized (refers to ring formation) to the pigment with benzenesulfonyl chloride at 180°C (356°F). The crude pigment is subsequently washed and filtered. 19 Ortho-dichlorobenzene is also used as a process solvent in the manufacture of another oxazine pigment (C.I. 51300); however, no specific process information was available at the time this report was prepared. Pyranthrone dye (C.I. 59700) can be made from either 1-chloro-2-methylanthraquinone or pyrene as the principal organic starting material. Glass-lined, stirred reaction vessels are required due to the corrosive nature of the reactants. Ortho-dichlorobenzene is used as a process solvent in this process. The dimerization of the 1-chloro-2-methyl-anthraquinone takes place at 150° to 160°C (302° to 320°F) in 6 hours, while cyclization to the dye requires an additional 3 hours at the same temperature. The anthraquinone dye which uses o-DCB as a process solvent is an oxazole compound (C.I. 67000) and is made from 2-amino-3-hydroxyanthraquinone. Batch-type reactions made of iron and with good stirrers are typically used. In addition, the reactor must have a cooling coil to remove heat generated by the moderately exothermic first reaction between the aminoanthraquinone and the acid chloride. The cyclization of the resulting amide to the desired oxazole is carried out in o-DCB at 140°C (284°F) in 5 hours. 20" (p. 77) "Textile Dyeing Monochlorobenzene (MCB) and o-dichlorobenzene (o-DCB) are effective dye carriers in the coloring of textile products. 18,22 Dye carriers or dyeing accelerants are used to promote dye migration and transfer to produce even and satisfactory dyeings. They may be used on cellulose triacetate fibers, but are typically used on polyester." (p. 86) USE OF ORTHO-DICHLOROBENZENE AS A SOLVENT IN PHARMACEUTICAL MANUFACTURING (p. 91) "Ortho-dichlorobenzene is used as a solvent in the manufacturing of pharmaceutical products by chemical synthesis. Synthetic pharmaceuticals are normally manufactured in batch operations, many of which involve the use of solvents. Figure 5-3 presents basic operations that may be used in a batch synthesis process. To begin a production cycle, the reactor is washed with water and dried with a solvent. Air or nitrogen is usually used to purge the tank after it is cleaned. Solid reactants and solvent are then charged to the reactor (Step 1). After the reaction is complete, remaining unreacted volatile compounds and solvents may be distilled off, typically using a water cooled condenser. The pharmaceutical product is then transferred to a holding tank (Step 2). In the holding tank, the product may be washed three to four times with water or solvent to remove any remaining reactants and byproducts. The solvent used in washing is generally distilled from the reaction product (Step 3). The crude product may then be dissolved in another solvent and transferred to a crystallizer for purification (Step 4). After crystallization, the solid material is separated from the remaining solvent by centrifuging (Step 5). While in the centrifuge, the product cake may be washed several times with water or solvent. Tray, rotary, or fluid-bed dryers are employed for final product finishing (Step 6)." USE OF CHLOROBENZENES AS SOLVENTS IN ORGANIC SOLVENT CLEANING OPERATIONS (p. 99) "Surface cleaning or degreasing includes the solvent cleaning or conditioning of metal surfaces and parts, fabricated plastics, electronic and electrical components, and other nonporous substrates. These cleaning processes are designed to remove foreign materials such as grease, oils, waxes, carbon deposits, and moisture, usually in preparation for further treatment such as painting, electroplating, galvanizing, anodizing, or applying conversion coatings. Chlorobenzenes are employed as cleaning and degreasing agents in solvent cleaning operations to remove water-insoluble soils from metal, plastic, fiberglass or other surfaces. Ortho-DCB is contained in automobile engine cleaners; carburetor cleaners; in formulations to remove paints, inks, varnishes, lacquers, resins, gums, waxes, heavy greases, acetylcellulose, sulfur and organic sulfur compounds, and tarry substances in stills and processing equipment; shoe polish; metal polish; rust preventatives; and other cleaning/polishing formulations" Throughput: "in 1988, the production of 3,4-dichloroaniline consumed 11.3 million kilograms (25 million pounds) of o-DCB" (p. 65)

Continued on next page ...

General Engineering Assessment

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Study Citation:	(1994). Locating and Estimating Air Emissions from Sources of Chlorobenzenes (Revised March 1994).
HERO ID:	1998192
Conditions of Use:	Manufacturing, Processing as a Reactant, Dyes and Pigments, Use of Synthetic Dye and Pigments, Use of o-DCB as a processing solvent or reaction media, Disposal

		EVALUATION	
Domain	Metric	Rating	Comments
Number of sites:	MFG: 3 (p. 50)Monsanto CompanyMonsanto Industrial Chemicals CompanySauget, Illinois4.5 million kgs/yrPPG Industries, Inc.Chemicals GroupIndustrial Chemical DivisionNatrium, West Virginia9 million kg/yrStandard Chlorine Chemical Company, Inc.Delaware City, Delaware22.7 million kg/yrUse: 1 (p. 65)Textile dyeing (p. 86): In 1987, 106 wool, broadwoven fabric mills, 245 plants producing broadwoven fabrics of man-made fibers and finishing silk, and 176 finishing plants for man-made fibers and silk were in operation in the United States.		

		EVALUATION	
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The report uses high quality data and/or techniques or sound methods that are from frequently used sources (EPA) 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	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Low	The report is more than 20 years old. The report captures operations, equipment, and worker activities that are expected to be outdated.
	Metric 5: Sample Size	N/A	N/A - Data not based on sampling
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	High
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Study Citation:	NICNAS, (2001). Priority existing chemical assessment report no. 14: Ortho-dichlorobenzene.		
HERO ID:	5155563		
Conditions of Use:	Import		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	Source contains PV information for Austrailia, no PV data for US. "Approximately 10 tonnes of o-DCB were imported for industrial use in 1998, with similar quantities imported in 1997 and 1996. "		
Life cycle description:	Import (Australia)		
Throughput:	"Formulation: 5 days/yr End use in solvents: 200 days/yr"		
Chemical concentration:	The resulting o-DCB, as a technical grade, is approximately 80% o-DCB with less than 19% of 1,4- and 1,3-dichlorobenzene, less than 1% trichlorobenzenes and less than 0.05% monochlorobenzene although this may vary depending on production methods. A purified grade is produced containing 98% o-DCB with less than 0.2% 1,2,4- trichlorobenzene and 0.05% monochlorobenzene. Technical grade o-DCB can contain from 15% to 30% of p-DCB		
Physical form:	liquid		
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 from Australia (OECD)
	Metric 3: Applicability	Medium	Data are for foreign import, which may be applicable to domestic import(in-scope)
	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 - PV and market data not based on sampling
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:	NLM, (n.d.). Hazardous agents: o-Dichlorobenzene.			
HERO ID:	10143102			
Conditions of Use:	Solvents			
EXTRACTION				
Parameter	Data			
Life cycle description:	"Used as a chemical intermediate, solvent, heat transfer liquid, deodorant, and insecticide; [ACGIH] Used as a degreasing agent, a paint solvent, paint remover, a cylinder lubricant, and a solvent for waxes, gums, resins, tars, rubber, oils, and asphalts; [HSDB]"pg. 1			
Comments:	Solvents is what is listed as "Major Category" on pg. 1			
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 (e.g., European Union or OECD reports, NIOSH HHEs, journal articles, 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	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	High	Data was accessed within the last 10 years
	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 report does not address variability or uncertainty.
Overall Quality Determination			High	

Study Citation:	OECD, (2001). SIDS initial assessment report for 13th SIAM: 1,2-Dichlorobenzene.			
HERO ID:	5185293			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	"1,2-Dichlorobenzene is manufactured in Europe, the USA, Canada, Mexico and China. Production figures were reported to be approximately 16,500 tonnes for Western Europe in 1983 and approximately 23,680 tonnes produced by the USA in 1984 (BUA, 1990). More recent figures indicate that in 1999 a production volume of about 54,000 per year of 1,2-dichlorobenzene was manufactured by only a few producers in the Western world. The manufacture was shared by Western Europe (37%), USA (27%), Brazil (6%), Japan (24%) and other Asia (6 %). Of this, about 67% was used in chemical synthesis, about 11% as a solvent (e.g. about 7 % for TDI processing) and 22 % for other applications not known (Bayer AG Leverkusen, personal communication, September 2001). "			
Life cycle description:	Manufacturing			
Chemical concentration:	Composition of technical grade product: 65-85 % 1,2-dichlorobenzene, < 0.05 % chlorobenzene, < 0.5 % trichlorobenzene, remainder 1,4- and 1,3-dichlorobenzene. Pure grade: > 99.8 % 1,2-dichlorobenzene, < 0.05 % chlorobenzene, < 0.1 % trichlorobenzene, < 0.1 % 1,4-dichlorobenzene.			
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 US
	Metric 3:	Applicability	High	Data are for domestic 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	N/A	N/A - PV and market data not based on sampling
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, (2011). Emission scenario document on the chemical industry.			
HERO ID:	6306753			
Conditions of Use:	disposal			
EXTRACTION				
Parameter	Data			
Life cycle description:	Different aspect of life cycle are production, formulation, industrial application, service life, recovery, waste treatment, handling and storage and transfer and transport. The production of a substance starts with the actual chemical reaction in which the substance is formed. Emissions during reaction may occur to air and wastewater. Also after the reaction emissions to air and wastewater will occur due to cleaning. Intermediates may be converted – life cycle stage processing – into the next compound directly after synthesis in the same reactor (without isolation and purification) – pathway			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	article provides high quality information
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	OECD country
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	the article is less than 10 years old
	Metric 5:	Sample Size	N/A	N/A - Data not based on sampling
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	N/A	N/A- data not based on this metric
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A- data not based on this metric
Overall Quality Determination			High	

Study Citation:	Penalver, R., Marin, C., Arroyo-Manzanares, N., Campillo, N., Vinas, P. (2022). Authentication of recycled plastic content in water bottles using volatile fingerprint and chemometrics. Chemosphere 297:134156.			
HERO ID:	11457810			
Conditions of Use:	Recycling			
EXTRACTION				
Parameter	Data			
Process description:	Plastic recycling generally consists of collection of plastic materials, washing of the collected materials, and thermal degradation of the plastic polymers. VOCs may be extracted from the recycled plastics by a variety of methods including headspace solid phase microextraction, thermal desorption, and static headspace. Solvent extraction techniques also exist such as microwave assisted extraction (MAE)and selected ionflow-tube mass spectrometry (MS) usually followed by GC-MS detection.			
Comments:	Chemical concentration not given. Table 1 just shows the certainty of the identity of detected compounds. Table 4 doesn’t include o-DCB. More relevant to consumer but does show o-DCB present within some samples of Polyethylene terephthalate (PET) in the study.			
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 Spain, an OECD country.
	Metric 3:	Applicability	High	Data are for recycling, 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. [2022]
	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	

General Engineering Assessment

Study Citation:	programs, E.O. (1974). Air pollution control engineering and cost study of the paint and varnish industry.			
HERO ID:	6580284			
Conditions of Use:	manufacturing			
EXTRACTION				
Parameter	Data			
Life cycle description:	The paint and varnish industry is made up of about 1,500 companies operating about 1,700 plants (1969 data). The industry is well distributed geographically throughout the country and production volume is definitely related to density of population. Even though about 36 companies account for about 64% of the total sales, the industry is one of the few remaining which contains numerous small companies that specialize in a limited product line to be marketed within a geographical region. There are fewer than 20 companies that sell paint nationwide. The industry is technically one of the most complex of the chemical industry. A plant that produces a broad line of products might utilize over 600 different raw materials and purchased intermediates. These materials can be generally classified in the following categories: oils, metallic driers, resins, pigments, extenders, plasticizers, solvents, dyes, bleaching agents, organic monomers for resins, and additives of many kinds. The industry produces an equally large number of finished products which are generally classified as trade sale finishes, maintenance finishes, and industrial finishes. The trade sale products and maintenance finishes are used for the protection and upkeep of factories, buildings, and structures such as bridges and storage tanks. Industrial finishes are generally defined as those applied to manufactured products. These finishes, such as automotive, aircraft, furniture, and electrical finishes are usually specifically formulated for the using industry. Trade sale finishes and industrial finishes are produced in almost equal volume with the production for 1972 estimated at 465 million gallons for trade sales and 485 million gallons for industrial finishes. Trade sales, however, are estimated to account for 55% of the dollar sales or about \$1,715 million dollars.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	This is an EPA report
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US data
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	The report is greater than 20 years old
	Metric 5:	Sample Size	N/A	N/A - information not dependent on samples
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	N/A	N/A - information not dependent on metada
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - information not dependent on metada
Overall Quality Determination	High			

Study Citation:	Ren, Z., Lu, Y., Li, Q., Sun, Y., Wu, C., Ding, Q. (2018). Occurrence and characteristics of PCDD/Fs formed from chlorobenzenes production in China. Chemosphere 205:267-274.			
HERO ID:	4912589			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	China: Produced 78.6 kilotons of di-CB in 2013			
Process description:	Route B: Deep catalytic chlorination to mono-CB, di-CB and tri-CB (figure 2)			
Number of sites:	4			
Physical form:	liquid			
Comments:	China: Produced 78.6 kilotons of di-CB in 2013			
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	China (Non-OECD)
	Metric 3:	Applicability	Medium	CoU’s not in scope (foreign manufacturing) but may be applicable to domestic manufacturing
	Metric 4:	Temporal Representativeness	High	Data from 2018
	Metric 5:	Sample Size	N/A	N/A - PV and market data not based on sampling
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Methodology 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:	RIVM, (1991). Integrated criteria document chlorobenzenes. :281.			
HERO ID:	5159927			
Conditions of Use:	Use			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	30 tonnes/yr			
Life cycle description:	Solvent			
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 from Netherlands (OECD)
	Metric 3:	Applicability	High	Data are for use of o-DCB as a solvent (in-scope)
	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 - PV and market data not based on sampling
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:	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:		US 1992 Production: 15,257,000 kg		
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 (data from industry).
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the US
	Metric 3:	Applicability	High	Data are for domestic 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 - PV and market data not based on sampling
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. BLS, (2023). U.S. Census Bureau of Labor Statistics Data from 2021.			
HERO ID:	11138808			
Conditions of Use:	All			
EXTRACTION				
Parameter	Data			
Number of sites:	Used to develop a method to estimate number of sites and workers.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	BLS is expected to use reliable survey methods.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	U.S. based economic data	
	Metric 3: Applicability	High	These economic data cover all industry and occupation types in scope for all chemicals.	
	Metric 4: Temporal Representativeness	High	The BLS OES data are from 2021	
	Metric 5: Sample Size	High	The BLS OES program provides detailed statistics and estimated relative standard error for each state, industry, and occupation survey conducted (https://www.bls.gov/oes/current/oes_research_estimates.htm).	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	BLS documents results and methods, but underlying survey results not accessible.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Limited discussion of variability and uncertainty in results.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2020). 2020 CDR: Commercial and consumer use.			
HERO ID:	10366189			
Conditions of Use:	Import			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Provides U.S. domestic imported PV and %PV to downstream uses.			
Number of sites:	Provides number of import sites.			
Chemical concentration:	Provides concentration.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	EPA is a trusted source.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	CDR is U.S. based data.	
	Metric 3: Applicability	High	CDR covers chemical importers, which are in scope for o-DCB	
	Metric 4: Temporal Representativeness	High	EPA used data from the 2020 CDR, which includes data reported for 2020.	
	Metric 5: Sample Size	Medium	Due to reporting threshold, statistical representativeness is unclear.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Submissions do not include method of how production volumes were determined. CDR industry sector codes, industrial processing and use codes, industrial function codes, and commercial product codes provide good metadata; but lack of clarifying information and narratives and occasional misreportings limit clarity of data.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	CDR data do not address variability or uncertainty in submitter provided data.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2020). 2020 CDR: Commercial and consumer use.			
HERO ID:	10366189			
Conditions of Use:	Processing as a reactant Intermediate in Plastics Material and Resin Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Provides U.S. domestic PV and %PV to downstream uses.			
Number of sites:	Provides number of import sites.			
Chemical concentration:	Provides concentration.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	EPA is a trusted source.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	CDR is U.S. based data.	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	High	EPA used data from the 2020 CDR, which includes data reported for 2020.	
	Metric 5: Sample Size	Medium	Due to reporting threshold, statistical representativeness is unclear.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Submissions do not include method of how production volumes were determined. CDR industry sector codes, industrial processing and use codes, industrial function codes, and commercial product codes provide good metadata; but lack of clarifying information and narratives and occasional misreportings limit clarity of data.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	CDR data do not address variability or uncertainty in submitter provided data.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2020). 2020 CDR: Commercial and consumer use.			
HERO ID:	10366189			
Conditions of Use:	Commercial-Solvent			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Provides %PV to downstream uses.			
Life cycle description:	Paints and Coatings and Ink, Toner, and Colorant Products			
Chemical concentration:	Provides concentration.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	EPA is a trusted source.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	CDR is U.S. based data.	
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	High	EPA used data from the 2020 CDR, which includes data reported for 2020.	
	Metric 5: Sample Size	Medium	Due to reporting threshold, statistical representativeness is unclear.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Submissions do not include method of how production volumes were determined. CDR industry sector codes, industrial processing and use codes, industrial function codes, and commercial product codes provide good metadata; but lack of clarifying information and narratives and occasional misreportings limit clarity of data.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	CDR data do not address variability or uncertainty in submitter provided data.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2026). Chemical Data Reporting (CDR): Reporting year 2024.			
HERO ID:	13246149			
Conditions of Use:	Manufacture, Import, Processing as a reactant, Use of laboratory chemicals, Plastics Compounding, and Industrial use of solvents			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Provides PV for multiple OES.			
Life cycle description:	Provides %PV to downstream OES uses.			
Number of sites:	Provides number of sites for multiple OES.			
Chemical concentration:	Provides concentration for multiple OES.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	EPA is a trusted source.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	CDR is U.S. based data.
	Metric 3:	Applicability	High	CDR covers multiple OES, which are in scope for the chemical.
	Metric 4:	Temporal Representativeness	High	EPA used data from the 2024 CDR.
	Metric 5:	Sample Size	Medium	Due to reporting threshold, statistical representativeness is unclear.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Submissions do not include method of how production volumes were determined. CDR industry sector codes, industrial processing and use codes, industrial function codes, and commercial product codes provide good metadata; but lack of clarifying information and narratives and occasional misreportings limit clarity of data.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	CDR data do not address variability or uncertainty in submitter provided data.
Overall Quality Determination			High	

Study Citation:	U.S. EPA, (2020). 2020 CDR data.			
HERO ID:	6275311			
Conditions of Use:	Manufacture and Import			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Provides U.S. domestic manufactured and imported PV and %PV to downstream uses.			
Number of sites:	Provides number of manufacturing and import sites.			
Chemical concentration:	Provides concentration.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	EPA is a trusted source.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	CDR is U.S. based data.	
	Metric 3: Applicability	High	CDR covers chemical manufacturers and importers, which are in scope for all chemicals. Also, downstream industrial use categories are specified, which include multiple relevant OESs.	
	Metric 4: Temporal Representativeness	High	EPA used data from the 2016 CDR, which includes data reported for 2015.	
	Metric 5: Sample Size	Medium	Due to reporting threshold, statistical representativeness is unclear.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Submissions do not include method of how production volumes were determined. CDR industry sector codes, industrial processing and use codes, industrial function codes, and commercial product codes provide good metadata; but lack of clarifying information and narratives and occasional misreportings limit clarity of data.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	CDR data do not address variability or uncertainty in submitter provided data.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (2010). Manufacture and use of printing inks - generic scenario for estimating occupational exposures and environmental releases: Draft.				
HERO ID:	6385710				
Conditions of Use:	Manufacturing				
EXTRACTION					
Parameter	Data				
Process description:	The manufacturing of printing inks consists of two major processes: vehicle preparation and dispersion. Vehicle preparation consists of creating and mixing all other components of the ink except the dye or pigment. The process can consist of polymerization of resins, solvent mixing, and dissolving of other solid and liquid components. These processes are conducted in various types of autoclaves, reactors and high speed mixers. The dispersion stage is where dyes and pigments are added to the ink vehicle to form the final product. Dispersion is done in ball or media mills. The type of media used in the mills depends on the color, texture and final use of the ink product (Kirk-Othmer, 2004). Figure 2-1 shows the basic process flow for printing ink manufacturing.				
Number of sites:	In 2007, the US Census Bureau reported 473 establishments under NAICS code 325910 for printing ink manufacturingTable 2-2: 2007 Economic Census Data for Printing Ink Use IndustriesIndustry Averages No. of Establishments 4,221Table 2-4: 2007 TRI Data for Printing Ink Manufacturing,Number of Facilities Reporting -160				
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. EPA generic scenario document	
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States	
	Metric 3:	Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation. Not Specific to oDCB	
	Metric 4:	Temporal Representativeness	Medium	The report is generally 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	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			High		

Study Citation:	U.S. EPA, (2010). Manufacture and use of printing inks - generic scenario for estimating occupational exposures and environmental releases: Draft.			
HERO ID:	6385710			
Conditions of Use:	Industrial use - Printing Operations			
EXTRACTION				
Parameter	Data			
Process description:	most modern industrial printing processes can be categorized as lithographic, flexographic, gravure, letterpress, or screen printing with digital printing and other plateless printing technologies becoming more prominent. (P. 10/23)			
Number of sites:	Commercial Lithographic Printing - 159Commercial Gravure Printing - 156Commercial Flexographic Printing - 32Commercial Screen Printing - 23Digital Printing - 8Other Commercial Printing - 16			
Comments:	Details of each process provided in the document.			
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. EPA generic scenario document	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States	
	Metric 3: Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation. Not Specific to oDCB	
	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	process description	
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	Low	The report does not address variability or uncertainty.	
Overall Quality Determination		High		

Study Citation:	U.S. EPA, (1991). Granular detergents manufacture - generic scenario for estimating occupational exposures environmental releases: Draft.		
HERO ID:	6385740		
Conditions of Use:	cleaning and washing agent		
EXTRACTION			
Parameter	Data		
Life cycle description:	Granular Detergent Manufacture		
Process description:	Raw material receipt and storage, paste making (surfactant), adding additives, mixing and pumping, spray drying, cooling/screening/mixing, packaging		
Throughput:	300,000-500,000 kg detergent/site-day		
Number of sites:	Provides estimate for estimating number of sites assumed 300 days/yr of operation, chemical PV, and conc of chem in detergent		
Chemical concentration:	Provides conc. estimates based on function of chemical in product		
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	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 functions
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:	Discharge			
EXTRACTION				
Parameter	Data			
Number of sites: Provides data for o-DCB for reporting years 2012 - 2019. In 2019, 17 facilities reported emission data. These 17 facilities are in 7 states				
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	The release data methodology is known or expected to be accurate and is known to cover all release sources at the site.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States	
	Metric 3: Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	High	The release data is no more than 10 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	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The release data study does not address variability or uncertainty.	
Overall Quality Determination		High		

Study Citation:	Ware, G. W. (1988). Ortho-, meta-, and para-dichlorobenzene. Reviews of Environmental Contamination and Toxicology 106:51-68.			
HERO ID:	4912307			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Production of the DCB isomers in 1981 was 11 million lb (4.99 million kg) for the ortho-isomer			
Life cycle description:	Domestic manufacturing			
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 US
	Metric 3:	Applicability	High	PV is in-scope
	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 - Data not based on sampling
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:	Zaman, R. (1992). Solving air emissions problems from metal cleaning operations. The National Environmental Journal 2(4):44.			
HERO ID:	5489562			
Conditions of Use:	commercial and consumer use			
EXTRACTION				
Parameter	Data			
Process description:	O-DCB can be used as a degreaser. The metal parts cleaning process is as follows. • Parts are fed into a reservoir of solvent either in batch quantities, or continuously. • Parts are suspended in solvent vapor or immersed in liquid solvent for a given period of time. • Parts are removed from the reservoir and allowed to dry.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	report presents high quality techniques
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	US data
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	the article is greater than 20 years old
	Metric 5:	Sample Size	N/A	N/A - information not dependent on samples
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	N/A	N/A - information not dependent metada
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - information not dependent metada
Overall Quality Determination		High		

Study Citation:	Zenser, L. P., Lang, A., Knecht, U. (1997). N-acetyl-S-(dichlorophenyl)cysteines as suitable biomarkers for the monitoring of occupational exposure to 1,2-dichlorobenzene. International Archives of Occupational and Environmental Health 69(4):252-254.			
HERO ID:	5243424			
Conditions of Use:	Manufacturing			
EXTRACTION				
Parameter		Data		
Production, import, or use volume:		In 1989 12 000 tons of 1,2-DCB were produced in the former FRG		
Life cycle description:		Foreign Manufacturing		
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 Germany (OECD)
	Metric 3:	Applicability	Low	Data are for PV of foreign manufacturing, but might be relevant to domestic manufacturing or other in-scope CoU's
	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	N/A	N/A - PV and market data not based on sampling
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	