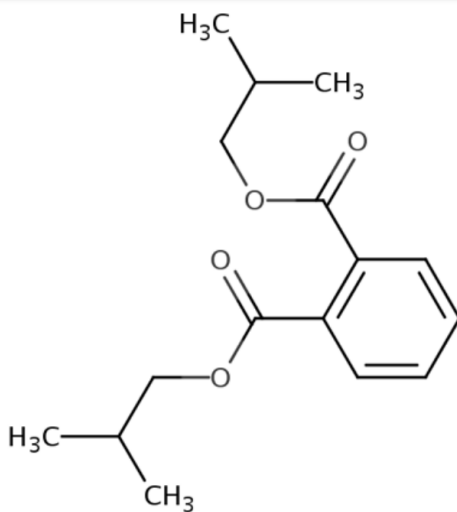


**Data Quality Evaluation and Data Extraction Information for  
Environmental Release and Occupational Exposure for  
Di-isobutyl Phthalate (DIBP)  
(1,2-Benzenedicarboxylic acid, 1,2-bis(2-methylpropyl) ester)**

**Systematic Review Support Document for the Risk Evaluation**

**CASRN: 84-69-5**



*December 2025*

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

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

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

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<b>9102524</b>	U.S. EPA, (2016). Federal research action plan on recycled tire crumb used on playing field and playgrounds. Status report.	<b>396</b>
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<b>5043338</b>	Velázquez-Gómez, M., Hurtado-Fernández, E., Lacorte, S. (2019). Differential occurrence, profiles and uptake of dust contaminants in the Barcelona urban area. Science of the Total Environment 648:1354-1370.	<b>399</b>
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<b>7976469</b>	Ügdüler, S., Geem, Van, K. M., Roosen, M., Delbeke, P., E.I., Meester, De, S. (2020). Challenges and opportunities of solvent-based additive extraction methods for plastic recycling. <i>Waste Management</i> 104:148-182.	<b>407</b>

<b>Study Citation:</b>	Albar, H., Ali, N., Shahzad, K., Ismail, I., I.M., Rashid, M. I., Wang, W.,ei, Ali, L. N., Eqani, S. (2017). Phthalate esters in settled dust of different indoor microenvironments; Source of non-dietary human exposure. Microchemical Journal 132:227-232.			
<b>HERO ID:</b>	3859024			
<b>Conditions of Use:</b>	Household/consumer use			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	ingestion, inhalation			
Physical form:	dust			
Area sampling data:	Table 1 gives concentrations of indoor dust (ug/g) - min, max, mean, median: Saudi Floor dust - 5.24, 102, 33.6, 22.1; Saudi car dust - 4.4, 831, 119, 18.9; Saudi AC filter dust - 3.08, 91.3, 31, 27.2; Kuwaiti floor dust - 4.05, 92.1, 20, 17.2; Kuwaiti car dust - 0.49, 50, 4.6, 1.1. Dust samples from other countries in Table 2, does not mention if they are means, medians or maxes, etc (ug/g): Sweden - 104, 45, 21; Denmark - 27, 8.8; Germany - NA; France - 20, 68; Another Kuwait study - NA; Bulgaria - NA; China - 17; USA - 3.8, 1.9; Spain - 38; UK - 52, Finland - 19			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Source is peer reviewed so methodology is high quality.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data is primarily for Saudi Arabia and Kuwait, both non-OECD countries.
	Metric 3:	Applicability	Uninformative	Data is gen pop house hold exposure and does not have to do with any occupational setting.
	Metric 4:	Temporal Representativeness	High	Data is less than 10 years old.
	Metric 5:	Sample Size	Medium	Range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Includes sample type, exposure route, and physical form.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by looking at different indoor environments and comparing to other studies. Does not address uncertainty.
Overall Quality Determination		Uninformative		

<b>Study Citation:</b>	Christia, C., Poma, G., Harrad, S., Wit, De, C. A., Sjostrom, Y., Leonards, P., Lamoree, M., Covaci, A. (2019). Occurrence of legacy and alternative plasticizers in indoor dust from various EU countries and implications for human exposure via dust ingestion and dermal absorption. Environmental Research 171:204-212.			
<b>HERO ID:</b>	5772597			
<b>Conditions of Use:</b>	consumer use - household			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	dust inhalation, ingestion and dermal absorption			
Area sampling data:	Units in ug/g. Homes in Belgium had mean: 7.6, median: 9.4, SD: 12, Min: 1.2, Max: 51. Ireland homes had mean: 32, median: 7.0, SD: 58, min: 4.6, max: 150. Netherland homes had mean: 7.0, median: 4.7, SD: 7.9, min: <LOQ, max: 26. Netherland offices had mean: 5.6, median: 3.2, SD: 6.5, min: 1.3, max: 22. Sweden offices had mean: 6.3, median: 3.5, SD: 6.8, min: 0.20, max: 21. Sweden daycare centers (winter) had mean: 20, median: 19, SD: 15, min: 5.6, max: 35. Sweden daycare centers (spring) had mean: 6.8, median: 6.8, SD: 0.32, min: 654 (???), max: 7.0			
Comments:	States no time was kept during sampling			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Journal is peer reviewed so likely contains high quality data and exposure comparisons are for EU and EPA.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data is for EU OECD countries: Belgium, Ireland, Sweden, and Netherlands
	Metric 3:	Applicability	Uninformative	Report is for gen pop studies for household, daycare and office space phthalate dust.
	Metric 4:	Temporal Representativeness	High	Report is from 2019
	Metric 5:	Sample Size	Medium	Distribution of samples characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data includes sample type, sample location but no other metadata
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Addresses variability by sampling across different countries and addresses uncertainty through its description of determining limits of quantitation.
Overall Quality Determination		Uninformative		

<b>Study Citation:</b>	Craig, J. A., Ceballos, D. M., Fruh, V., Petropoulos, Z. E., Allen, J. G., Calafat, A. M., Ospina, M., Stapleton, H. M., Hammel, S., Gray, R., Webster, T. F. (2019). Exposure of nail salon workers to phthalates, di(2-ethylhexyl) terephthalate, and organophosphate esters: A pilot study. Environmental Science & Technology 53(24):14630-14637.			
<b>HERO ID:</b>	6318028			
<b>Conditions of Use:</b>	Personal Care Products - Nail Salon Workers			
EXTRACTION				
Parameter	Data			
Worker activity description:	nail technicians and nail salon owners			
Exposure route:	inhalation			
Personal sampling data:	<17.6-56.1 ng/g, median <17.6 ng/g			
Exposure duration:	8 hours/day			
Exposure frequency:	40 hours/week			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Sampling/analytical methodology is not an approved OSHA/NIOSH method but is an acceptable methodology.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Medium	Data are for the use of nail polish at a salon, which is similar to the commercial use of paints and coatings.
	Metric 4:	Temporal Representativeness	High	Monitoring data are no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (means, standard deviations, medians, ranges) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Most critical metadata included.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability addressed by sampling at seven salons during multiple days.
Overall Quality Determination			High	

<b>Study Citation:</b>	ECHA, (2012). Committee for Risk Assessment (RAC) Committee for Socio-economic Analysis (SEAC): Background document to the Opinion on the Annex XV dossier proposing restrictions on four phthalates: Annexes.
<b>HERO ID:</b>	7325405
<b>Conditions of Use:</b>	use

EXTRACTION	
Parameter	Data
Worker activity description:	Workers using or manufacturing footwear, flooring (e.g. PVC tiles, coverings and sheets), bathroom accessories (e.g. shower caps, shower curtains, hanging organisers, pillow for bathtub, shower tray and rack, faucet), vehicle and mechanical parts (e.g. motor cycles, seals, valves, bellows).
Exposure route:	inhalation, oral, dermal
Physical form:	Colourless liquid
Area sampling data:	Recent sampling of articles showed that DIBP can be present in concentrations up to 355,000 mg/kg. Some of the articles included school bags and children's risk watches, where DIBP was found in concentration of respectively 830-3,100 mg/kg and 70-50,000 mg/kg. Recent sampling of flooring products revealed the concentrations of DIBP 56-73,650 mg/kg.
Dermal exposure data:	Dermal exposure data

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Low	Sampling or analytical methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country. other than the U.S.
	Metric 3:	Applicability	High	The data are for an occupational scenario within the scope of the risk evaluation.
	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	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

**Low**

<b>Study Citation:</b>	General Motors, (1982). Determination of chemicals in the air in Fisher Body Division model shops with cover letter.			
<b>HERO ID:</b>	1312370			
<b>Conditions of Use:</b>	Processing - incorporation into article			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	Model shop - wood mill machine operators			
Exposure route:	Inhalation			
Physical form:	vapor, dust/particulate			
Area sampling data:	Detected at 0.03 mg/g of particulate (Table 5, pg. 22/26)			
Comments:	Note: Article is barely legible			
<b>EVALUATION</b>				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Study conducted by NIOSH
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is for the US
	Metric 3:	Applicability	High	Data is for an occupational scenario - processing as a plasticizer
	Metric 4:	Temporal Representativeness	Low	Data is greater than 20 years old
	Metric 5:	Sample Size	Low	Samples characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data includes exposure type, worker activity, exposure route.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	Giovanoulis, G., Bui, T., Xu, F., Papadopoulou, E., Padilla-Sanchez, J. A., Covaci, A., Haug, L. S., Cousins, A. P., Magnér, J., Cousins, I. T., Wit, de, C. A. (2017). Multi-pathway human exposure assessment of phthalate esters and DINCH. Environment International 112:115-126.			
<b>HERO ID:</b>	4166920			
<b>Conditions of Use:</b>	Use			
EXTRACTION				
Parameter	Data			
Exposure route:	inhalation, dermal, ingestion			
Physical form:	dust, gas			
Personal sampling data:	247.5 ng/m3			
Area sampling data:	DIBP: 584.6 ng/m3			
Dermal exposure data:	Dermal exposure data			
Exposure duration:	24 hours/day			
Exposure frequency:	365 days/year			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is equivalent to an approved [OSHA/NIOSH] method.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Norway, an OECD country.
	Metric 3:	Applicability	Low	Data are for consumer use of personal care products, furniture and furnishings, and fabric products, which is similar to the in-scope occupational scenario commercial use of these categories.
	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 (percentiles, medians) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Most critical metadata included.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability addressed by performing Mann Whitney U tests.
Overall Quality Determination		Medium		

<b>Study Citation:</b>	Giovanoulis, G., Bui, T., Xu, F., Papadopoulou, E., Padilla-Sanchez, J. A., Covaci, A., Haug, L. S., Cousins, A. P., Magnér, J., Cousins, I. T., Wit, de, C. A. (2020). Corrigendum to "Multi-pathway human exposure assessment of phthalate esters and DINCH" [Environ. Int. 112 (2018) 115-126]. Environment International 143(Elsevier):106071.			
<b>HERO ID:</b>	7976806			
<b>Conditions of Use:</b>	Consumer Use			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	dust ingestion, inhalation, dietary intake (2/5)			
Physical form:	dust (2/5)			
Personal sampling data:	Daily inhalation intake is 113 (0.65-758 ng/kg/day). (4/5)			
Dermal exposure data:	Dermal exposure data			
Comments:	check Table S1-2			
EVALUATION				
Domain	Metric	Rating		Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	Medium	Sampling methodology not specified, but may be described in main article.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Sweden, Belgium, and Norway, al OECD countries.
	Metric 3:	Applicability	Low	Data are for consumer use of plastic products and ambient indoor air, which is similar to commercial use of plastic products, 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 (means, ranges, 95th percentiles) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Exposure concentration and route are provided but missing engineering controls, PPE, and frequency and duration of exposure.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology and by including corrections to the original report. Variability addressed by comparing results to other published studies.
Overall Quality Determination		Medium		



<b>Study Citation:</b>	Gkrillas, A., Dirven, H., Papadopoulou, E., Andreassen, M., Hjertholm, H., Husøy, T. (2021). Exposure estimates of phthalates and DINCH from foods and personal care products in comparison with biomonitoring data in 24-hour urine from the Norwegian EuroMix biomonitoring study. Environment International 155(Elsevier):106598.			
<b>HERO ID:</b>	7978731			
<b>Conditions of Use:</b>	Personal Care Products			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	dermal, oral, inhalation (2/13)			
Physical form:	liquids, gels, creams, etc. (8/13)			
Exposure duration:	24 hours (1/13)			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is equivalent to an approved [OSHA/NIOSH] method.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Norway, an OECD country.
	Metric 3:	Applicability	Low	Data are for consumer use of Personal care products, which is similar to the in-scope occupational scenario commercial use of personal care products.
	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	Low	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Sampling data and exposure type provided but missing worker information, exposure frequency, engineering controls, and PPE.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	The monitoring study does not address variability or uncertainty.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	González-Mariño, I., Rodil, R., Barrio, I., Cela, R., Quintana, J. B. (2017). Wastewater-based epidemiology as a new tool for estimating population exposure to phthalate plasticizers. Environmental Science & Technology 51(7):3902-3910.			
<b>HERO ID:</b>	3859087			
<b>Conditions of Use:</b>	Processing			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	inhalation, dermal, ingestion			
Area sampling data:	Ares: 182 ug/day/person Baiona: 198 ug/day/person Cambados: 395 ug/day/person Gondomar: 107 ug/day/person Nigran: 94 ug/day/person Santiago: 106 ug/day/person			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is equivalent to an approved [OSHA/NIOSH] method.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Spain, an OECD country.
	Metric 3:	Applicability	High	Data are for plasticizers in plastic and resin manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Monitoring data were collected after the most recent PEL and no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (means) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Area samples and exposure type provided but missing concentrations, engineering controls, PPE, particle size, and physical form.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability addressed by sampling in 6 cities.
Overall Quality Determination			High	

<b>Study Citation:</b>	Heitbrink, W. (1993). In-depth survey report: Control technology for autobody repair and painting shops at Team Chevrolet, Colorado Springs, Colorado.			
<b>HERO ID:</b>	6558535			
<b>Conditions of Use:</b>	Commercial use - spray painting.			
EXTRACTION				
Parameter	Data			
Worker activity description:	sanding, grinding, welding, spray painting.Autobody shop is located in a two-story building. Before the cars are painted, structural damage to the cars is repaired on the upper level of the shop which is illustrated in the article. This involves the repair and replacement of damaged parts. Workers may be exposed to aerosols from sanding, grinding, and welding. Shop does some restoration of automobiles. After structural damage repair, they are prepared for painting. This involves sanding, washing, and covering parts of hte vehicle that are not being painted with either paper or plastic. After the car has been painted, defects in the paint job are removed by buffing. In the upper level of the shop, vehicle preparation is done next to the spray painting booth. Lower level is illustrated in the article. Spray painting booths in the upper level were Trimatic cross draft spray painting booths. Air is supplied and exhausted through filters that are mounted in plenums (described in article). Filters are changed every four to five weeks. Before some painting jobs, the filters are wetted down with water which likely reduces air flow until the filters dry off.			
Number of workers:	13			
Personal protective equipment:	half face piece air purifying respirators are used to reduce worker exposure to paint overspray in spray painting booths. NIOSH study recommends use of supplied-air respirators operated in a positive pressure mode. Eye and skin protection to be worn - rubber gloves should be worn, presently in the study they wear uniforms.			
Engineering control:	Spray painting booths have air entering the booth through filters in the door or through a supply air plenum. Air flows parallel to the ground, around the car and toward exit filters located in the back of the car. Car remains in booth until dry. Two booths opearte at a flow rate of 9500 cfm, one booth had flow rate of 3000 cfm and increased to 7000 cfm when adjusted. At the time 12,000 cfm is specified by OSHA standard for spray painting.			
Comments:	There is sampling data but not for DIBP or any phthalates.			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling conducted by NIOSH
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is for US
	Metric 3:	Applicability	Medium	Occupational scenario falls under a condition of use but DIBP or phthalates are not mentioned in the source.
	Metric 4:	Temporal Representativeness	Low	Data is over 20 years old.
	Metric 5:	Sample Size	Low	No samples provided for DIBP.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	No samples for DIBP.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Low	

<b>Study Citation:</b>	Hines, C. J., Hopf, Nilsen, N. B., Deddens, J. A., Calafat, A. M., Silva, M. J., Grote, A. A., Sammons, D. L. (2009). Urinary phthalate metabolite concentrations among workers in selected industries: A pilot biomonitoring study. Annals of Occupational Hygiene 53(1):1-17.			
<b>HERO ID:</b>	1005742			
<b>Conditions of Use:</b>	processing - plasticizer			
EXTRACTION				
Parameter	Data			
Worker activity description:	DIBP identified as a chemical used in rubber gasket manufacturing. pg. 3 "In rubber processing, phthalate exposure could occur during compounding, mixing, milling, calendering and curing (or vulcanizing)."			
Exposure route:	inhalation, ingestion, dermal (bc of urinary metabolite sampling)			
Personal sampling data:	Urinary metabolite samples, no air samples were conducted or stated in the source. Metabolite conc. data is described in Table 4 for MIBP which correlates to the DIBP conc. exposed to individuals.			
Exposure duration:	"shift"			
Number of workers:	156			
Comments:	This is the source that multiple other sources use to model DIBP exposure.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Study approved by CDC and is peer reviewed.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is for US
	Metric 3:	Applicability	Low	Data is for urinary metabolite concentrations taken during shifts to determine exposure levels. Is useful to determine industries of exposure but actual sampling data is not air exposure.
	Metric 4:	Temporal Representativeness	Medium	Data is greater than 10 years old
	Metric 5:	Sample Size	Medium	Samples characterized by a range with uncertain statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data includes sample type, exposure durations, exposure frequency and industries
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability across multiple industries but does not address uncertainty.
Overall Quality Determination		Medium		

<b>Study Citation:</b>	Hines, C., Hopf, N., Deddens, J., Silva, M., Calafat, A. (2011). Estimated daily intake of phthalates in occupationally exposed groups. Journal of Exposure Science & Environmental Epidemiology 21(2):133-141.			
<b>HERO ID:</b>	697394			
<b>Conditions of Use:</b>	processing as a plasticizer			
EXTRACTION				
Parameter	Data			
Number of sites:	20			
Worker activity description:	DIBP is only identified as a chemical used in rubber gasket industry of all the industries tested			
Exposure route:	Biomonitoring covers inhalation, ingestion, and dermal			
Personal sampling data:	DiBP daily intake estimates ranged over several orders of magnitude (0.02–32 mg/kg/day). GM DiBP estimates were significantly different by sector (P<0.0001 each) and were highest in the rubber sectors: rubber boot (0.37 mg/ kg/day); rubber hose (0.31 mg/kg/day), and rubber gasket (0.31 mg/kg/day). Neither an RfD nor a TDI has been established for DiBP. The highest individual worker estimate (32 mg/kg/day) was in rubber hose, although DiBP use was not reported at the facility			
Number of workers:	156			
Comments:	Personal sampling conducted by biomonitoring of urinary metabolites			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Study is approved by NIOSH
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is for US
	Metric 3:	Applicability	Low	Data is for urinary metabolite sampling not for air exposures. However this source identifies industries of use and could still be used to that extent.
	Metric 4:	Temporal Representativeness	Medium	Source is greater than 10 years old
	Metric 5:	Sample Size	Medium	Samples are characterized by range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Metadata such as sample type, industry, sample durations is provided.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Addresses variability across multiple industries and addresses uncertainty in its calculation method.
Overall Quality Determination		Medium		

<b>Study Citation:</b>	Ishii, S., Katagiri, R., Minobe, Y., Kuribara, I., Wada, T., Wada, M., Imai, S. (2015). Investigation of the amount of transdermal exposure of newborn babies to phthalates in paper diapers and certification of the safety of paper diapers. Regulatory Toxicology and Pharmacology 73(1):85-92.			
<b>HERO ID:</b>	2915537			
<b>Conditions of Use:</b>	Use			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	dermal			
Dermal exposure data:	Dermal exposure data			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is equivalent to an approved [OSHA/NIOSH] method.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data is from Japan, an OECD country.
	Metric 3:	Applicability	Low	Data are for consumer exposure to personal care products, which is similar to commercial use of personal care products.
	Metric 4:	Temporal Representativeness	High	Monitoring data are no more than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Dermal data and exposure type provided but missing engineering controls, PPE, area/personal samples, duration, and physical form.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability addressed by sampling multiple brands of diapers.
Overall Quality Determination			High	

<b>Study Citation:</b>	Kang, Y., Man, Y. B., Cheung, K. C., Wong, M. H. (2012). Risk assessment of human exposure to bioaccessible phthalate esters via indoor dust around the Pearl River Delta. Environmental Science & Technology 46(15):8422-8430.
<b>HERO ID:</b>	1311700
<b>Conditions of Use:</b>	processing - plasticizer

EXTRACTION	
Parameter	Data
Area sampling data:	Total phthalate esters concentrations in workplace dust varied from 144 to 1809 ug/g with a median of 917 ug/g and a GM of 805 ug/g. Indoor dust conc. (ug/g): electronic factory - median: 19.8, range: 17.7 - 62.5; manufacturing plant - median: 40.4; range: 24.2 - 107; hospital - median: 24.71; range: 5.11-113; commercial office - median: 32.3; range: 13.4 - 79.2; secondary school - median: 57.1; range: 16.5 - 78.9; shopping mall - median: 30.9; range: 19.1 - 50.8
Comments:	manufacturing plants produced furniture, toys and textiles. Sampling sites included the machine using diesel for electric power; industrial area; and air-conditioner filters dust. The most abundant phthalate ester found was (DEHP) in both workplace dust and home dust, followed by (DBP) and (DIBP).

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Study is peer reviewed so likely has no flaws.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data is from China, a non-OECD country
	Metric 3:	Applicability	Low	Data contains some manufacturing data however it is for dust samples not air concentrations
	Metric 4:	Temporal Representativeness	High	Data likely less than 10 years old
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data includes sample type, industries, sampling site
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by sampling across multiple different sites but does not address uncertainty.

## Overall Quality Determination

**Medium**

<b>Study Citation:</b>	Masi, F., Lepri, L., Bubba, Del, M., Sacco, C., Nostro, Lo, A., Comodo, N. (1999). Organic chemicals and microbial facies of liquid aerosols from a wastewater treatment plant. Annali di Chimica 89(3-4):231-248.			
<b>HERO ID:</b>	680348			
<b>Conditions of Use:</b>	Municipal and industrial wastewater treatment			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Area sampling data:	Concentration of phthalates above aeration tanks of wastewater treatment plant over 10 months - 150-370 ng/m^3. Figure 5 shows concentrations on a graph of phthalates. Figure 8 provides a somewhat illegible graph of percentage makeup of different phthalates (DIBP making up anywhere between 10-30%			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Source is peer reviewed so methodology is likely high quality.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data is for Italy, an OECD country.
	Metric 3:	Applicability	Low	Data is applicable to municipal and industrial sewage treatment. Could be applied to certain forms of disposal.
	Metric 4:	Temporal Representativeness	Low	Data is over 20 years old.
	Metric 5:	Sample Size	Low	Characterized by a range but no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Only contains area sampling data.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability by sampling across multiple months. Does not address uncertainty.
Overall Quality Determination			Low	



<b>Study Citation:</b>	Okeme, J. O., Nguyen, L. V., Lorenzo, M., Dhal, S., Pico, Y., Arrandale, V. H., Diamond, M. L. (2018). Polydimethylsiloxane (silicone rubber) brooch as a personal passive air sampler for semi-volatile organic compounds. Chemosphere 208:1002-1007.			
<b>HERO ID:</b>	5017615			
<b>Conditions of Use:</b>	Office workers			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	using computer workstations in their offices			
Personal sampling data:	See Table 1: 227 ng/m3 (participant 1), 460 (participant 2), 423 ng/m3 (participant 3)			
Exposure duration:	8 hr/day			
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	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 limits, industry/ process technologies) may impact exposures relative to the U.S.
	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, such as a consumer DIY scenario that is similar to a worker scenario.
	Metric 4:	Temporal Representativeness	High	The operations, equipment, and worker activities associated with the data are expected to be representative of current operations, equipment, and activities. The monitoring data were collected after the most recent permissible exposure limit (PEL) establishment or update or are generally, no more than 10 years old, whichever is shorter. If no PEL is established, the data are no more than 10 years old. Metadata on the operations, equipment, and worker activities associated with the data show that the data should be representative of current operations, equipment, and activities.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Monitoring data include most critical metadata, such as sample type and exposure type, but lacks additional metadata, such as sample durations, exposure durations, exposure frequency, and/or worker activities.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	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.

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<b>Study Citation:</b> Okeme, J. O., Nguyen, L. V., Lorenzo, M., Dhal, S., Pico, Y., Arrandale, V. H., Diamond, M. L. (2018). Polydimethylsiloxane (silicone rubber) brooch as a personal passive air sampler for semi-volatile organic compounds. Chemosphere 208:1002-1007.			
<b>HERO ID:</b> 5017615			
<b>Conditions of Use:</b> Office workers			
Domain		Metric	<b>EVALUATION</b>
			Rating
<b>Overall Quality Determination</b>			<b>High</b>
Comments			

<b>Study Citation:</b>	OSHA, (2020). Chemical Exposure Health Data (CEHD).			
<b>HERO ID:</b>	6983058			
<b>Conditions of Use:</b>	All			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Personal sampling data:	Provides personal breathing zone and area monitoring data.			
Area sampling data:	Provides personal breathing zone and area monitoring data.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	OSHA and state inspectors are expected to use OSHA or NIOSH sampling methods. Samples sent to the OSHA SLTC are expected to be analyzed using OSHA or NIOSH analytical methods.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	U.S. based exposure data
	Metric 3:	Applicability	Medium	The OSHA data include occupational scenarios within the scopes of the chemicals as identified by NAICS code and facility name. However, some occupational scenarios are not clear and cannot be clearly mapped to conditions of use within scope.
	Metric 4:	Temporal Representativeness	High	Data provided by OSHA are not more than 10 years old.
	Metric 5:	Sample Size	High	Individual measurements are provided so the sample sets can be fully statistically characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	OSHA data include sample type and exposure type. Sample times also provided. Exposure frequency is inconsistently provided. Worker job descriptions provided, but often lacks sufficient clarity.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	OSHA data do not discuss variability or uncertainty.
Overall Quality Determination		High		

<b>Study Citation:</b>	Rudel, R. A., Brody, J. G., Spengler, J. D., Vallarino, J., Geno, P. W., Sun, G., Yau, A. (2001). Identification of selected hormonally active agents and animal mammary carcinogens in commercial and residential air and dust samples. Journal of the Air and Waste Management Association (1990-1992) 51(4):499-513.			
<b>HERO ID:</b>	198234			
<b>Conditions of Use:</b>	consumer use - household exposure			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	ingestion, inhalation			
Physical form:	dust, vapor			
Area sampling data:	6 dust samples (ug/g) - min: 1.05; max: 2.05; mean: 1.32; SD: 0.355. 5 air samples (ug/m^3) - min: 0.011; max: 0.108; mean: 0.049.			
Comments:	Sample taken in plastics workplace but it was not detected.			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Article is peer reviewed and states it uses EPA methods in some of its analysis.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is for US
	Metric 3:	Applicability	Low	Data is for non-occupational scenarios. One sample is from a plastics workplace but the chemical of interest was not detected.
	Metric 4:	Temporal Representativeness	Low	Data is greater than 20 years old
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics (min, max, mean, and SD)
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Provides sampling location at homes and sampling times but no other metadata provided
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Data addresses uncertainty in its limits of detection but does not address variability.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	U.S. EPA, (2021). Generic model for central tendency and high-end inhalation exposure to total and respirable Particulates Not Otherwise Regulated (PNOR).
<b>HERO ID:</b>	11373482
<b>Conditions of Use:</b>	Multiple OES

EXTRACTION	
Parameter	Data
Exposure route:	Inhalation
Physical form:	Dust (solid)
Personal sampling data:	Document gives a breakdown of # samples, # non-detects, min/max concentrations, mean concentration, 95th percentile concentration, and 50th percentile and 95th percentile PNOR for both total and respirable particulates. This data is given on PDF Pg. 11-16 for multiple industries.
Exposure duration:	8 hr/day

		EVALUATION	
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Sampling and Analytical Methodology	High	Sampling/analytical methodology is an approved OSHA/NIOSH method.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	High	Data are for multiple in-scope occupational scenarios.
	Metric 4: Temporal Representativeness	High	Monitoring data are no more than 10 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (min, max, mean, 95th percentile) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Sample type and exposure type provided but missing PPE, engineering controls, exposure frequency, worker activity, number of workers.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability addressed by providing both total and respirable PNOR.

## Overall Quality Determination

**High**

<b>Study Citation:</b>	U.S. EPA, (2024). Synthetic turf field recycled tire crumb rubber research under the Federal Research Action Plan, Final report part 2: Exposure characterization, volume 1.			
<b>HERO ID:</b>	11845992			
<b>Conditions of Use:</b>	Commercial Use - Toys, Playground, and Sporting Equipment			
EXTRACTION				
Parameter	Data			
Area sampling data:	Table 4-37, Page 130: "Diisobutyl phthalate; Field Dust Sample Mean = 0.29 mg/kg; Field Dust Sample Std Dev = 0.34 mg/kg; Field Dust Sample Maximum = 0.66 mg/kg"			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is equivalent to an approved OSHA/NIOSH method.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for fabrication of final product from articles, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Monitoring data are no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (median) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All metadata provided.
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	

<b>Study Citation:</b>	Velázquez-Gómez, M., Hurtado-Fernández, E., Lacorte, S. (2019). Differential occurrence, profiles and uptake of dust contaminants in the Barcelona urban area. Science of the Total Environment 648:1354-1370.			
<b>HERO ID:</b>	5043338			
<b>Conditions of Use:</b>	Consumer Use - Public Areas			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	Museum workers, library workers, high school staff			
Exposure route:	inhalation, ingestion			
Physical form:	indoor dust			
Exposure duration:	8 hours/ day for museum and library workers			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Sampling and Analytical Methodology	High	Sampling/analytical methodology is equivalent to an approved [OSHA/NIOSH] method.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Spain, an OECD country.
	Metric 3:	Applicability	Low	Data are phthalate concentrations in public and privates spaces, similar to in-scope occupational scenarios.
	Metric 4:	Temporal Representativeness	High	Monitoring data are no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (medians, ranges, maximums, minimums, frequencies) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Most critical metadata included.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability is addressed by sampling multiple locations for each different occupational scenario.
Overall Quality Determination		High		

<b>Study Citation:</b>	Frasch, H. F., Bunge, A. L. (2015). The transient dermal exposure II: post-exposure absorption and evaporation of volatile compounds. Journal of Pharmaceutical Sciences 104(4):1499-1507.			
<b>HERO ID:</b>	3230538			
<b>Conditions of Use:</b>	All (Dermal exposure scenarios)			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	dermal			
Physical form:	vapor/liquid			
Dermal exposure data:	Dermal exposure data			
<b>EVALUATION</b>				
Domain		Metric	Rating	Comments
Domain 1: Reliability		Metric 1: Methodology	High	Model is peer reviewed and free of mathematical errors, based on sounds approaches/methods, and uses appropriate equations and parameters
Domain 2: Representativeness		Metric 2: Geographic Scope	High	Data is from US
		Metric 3: Applicability	High	Model could be applied to manufacturing or processing scenario if correct parameters for DIBP were selected.
		Metric 4: Temporal Representativeness	High	Model is no more than 10 years old
Domain 3: Accessibility/ Clarity		Metric 5: Metadata Completeness	High	Model approach, equations, and choice of parameter values are transparent. Rationales for choice of approach, equations, and parameters are provided.
Domain 4: Variability and Uncertainty		Metric 6: Metadata Completeness	Medium	Variability is addressed by testing with different exposure times as well as liquid and vapor states of a phthalate. Uncertainty is not addressed.
<b>Overall Quality Determination</b>			<b>High</b>	



<b>Study Citation:</b>	Gong, M., Zhang, Y., Weschler, C. J. (2014). Predicting dermal absorption of gas-phase chemicals: Transient model development, evaluation, and application. Indoor Air 24(3):292-306.			
<b>HERO ID:</b>	2241693			
<b>Conditions of Use:</b>	Use			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	dermal			
Physical form:	gas			
Dermal exposure data:	Dermal exposure data			
Exposure duration:	24 hours/day			
Exposure frequency:	7 days/week			
<b>EVALUATION</b>				
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 are from the U.S., Denmark (OECD), and China (non-OECD).
	Metric 3:	Applicability	High	Model can be applied to commercial use of personal care products, and plastic and rubber products, both in-scope occupational scenarios.
	Metric 4:	Temporal Representativeness	High	Model is based on current industry conditions and based on data no more than 10 years old.
Domain 3: Accessibility/ Clarity	Metric 5:	Metadata Completeness	High	Model approach, equations, and choice of parameter values are transparent. Rationales for choice of approach, equations, and parameter values provided.
Domain 4: Variability and Uncertainty	Metric 6:	Metadata Completeness	High	Uncertainty is addressed by discussing uncertainties in parameter values. Variability addressed by doing a sensitivity analysis to four model parameters.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Pelletier, M., Bonvallot, N., Ramalho, O., Blanchard, O., Mercier, F., Mandin, C., Bot, Le, B., Glorennec, P. (2017). Dermal absorption of semivolatile organic compounds from the gas phase: Sensitivity of exposure assessment by steady state modeling to key parameters. Environment International 102:106-113.		
<b>HERO ID:</b>	3602893		
<b>Conditions of Use:</b>	All dermal exposure COUs		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Exposure route:	dermal		
Physical form:	gas		
Dermal exposure data:	Dermal exposure data		
<b>EVALUATION</b>			
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 are from France, an OECD country.
	Metric 3: Applicability	High	Model can be applied to commercial use of fabric product, furniture and furnishings, and personal care products, in-scope occupational scenarios.
	Metric 4: Temporal Representativeness	High	Model is based on current industry conditions and based on data no more than 10 years old.
Domain 3: Accessibility/ Clarity	Metric 5: Metadata Completeness	High	Model approach, equations, and choice of parameter values are transparent. Rationales for choice of approach, equations, and parameter values provided.
Domain 4: Variability and Uncertainty	Metric 6: Metadata Completeness	High	Uncertainty is addressed with respect to chosen parameters. Variability addressed by running a sensitivity analysis to 6 key parameters.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	Wormuth, M., Scheringer, M., Vollenweider, M., Hungerbuhler, K. (2006). What are the sources of exposure to eight frequently used phthalic acid esters in Europeans?. Risk Analysis 26(3):803-824.
<b>HERO ID:</b>	680214
<b>Conditions of Use:</b>	Consumer use

EXTRACTION	
Parameter	Data
Exposure route:	Inhalation, dermal, oral
Area sampling data:	Table 5 has min, median, mean, and max in indoor and outdoor ambient air: 61 ng/m (median) in indoor air; 0 ng/m <sup>3</sup> (median) in outdoor air. // For spray painting, a typical fingertip dispenser generates 25 grams of spray per minute and the fraction of particles that are available for inhalation is 0.005.
Dermal exposure data:	Dermal exposure data
Exposure duration:	For spray paints, the mean duration of spraying is 4 minutes and the mean contact time with aerosols is 15 minutes.
Exposure frequency:	Table 7 has frequency of use of personal care products: 0.29-2/day for deodorant; 0.12-1.5/day for perfume; 0.14-1/day for aftershave; 0.05-2/day for hair styling; 0.43-2/day for shampoo; 0.16-2/day for skin care; 0.11-1/day for nail care; 0.18-1/day for makeup; 0.11-8.43/day for baby products. // Spray paints are infrequently used by teenagers and adults (two times per year, which is 0.0055 per day).

EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	The model is free of mathematical errors and is based on scientifically sound approaches or methods. Equations and choice of parameter values are appropriate for the model's application (note: peer review may address appropriate application).
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/ process technologies) may impact exposures or releases relative to the U.S.
	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	The model is based on data that are generally more than 10 years but no more than 20 years old. However, the model is based on operations, equipment, and worker activities are expected to be reasonably representative of current 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	High	The model characterizes variability and uncertainty in the results.

## Overall Quality Determination

## High

<b>Study Citation:</b>	Burgess, W. A. (1991). Potential exposures in the manufacturing industry—Their recognition and control. :595-674.			
<b>HERO ID:</b>	1267867			
<b>Conditions of Use:</b>	Use (paints and coatings)			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	inhalation, dermal			
Physical form:	particles of powder, solvent vapors, solvents			
Particle size characterization:	Basecoat applications by air atomization had a MMAD of 4-14 um. Application by rotary atomizer generated particles of 25-35 um. In another study, the MMAD of lacquer mist was 6.4+-3.4 um and enamel had a MMAD of 5.7+-2.0 um.			
Number of workers:	Half a million workers in the U.S. are included in the application of paint products. Of this number, 200,000 are employed in autobody shops.			
Personal protective equipment:	The minimum respirator for all paint applications should be a combination mist-organic vapor air-purifying device. Higher levels of protection including air-supplied hoods or helmets may be necessary on certain systems such as spray application.			
Engineering control:	All storage and mixing vessels should be provided with close fitting covers designed with access ports. It should be normal to equip these 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 not by open pouring. Controls in the application of paint systems must include excellent housekeeping, effective ventilation control, and protective clothing. Adequate washing facilities should be available, and eating and drinking should be prohibited.			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Medium	Data are for the use of paints and coatings, but are a general model, and not for one specific 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 distribution characterized by limited statistics (means, standard deviations) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability is addressed by including different paint application techniques. Uncertainty isn't addressed.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Cousins, A. P., Remberger, M., Kaj, L., Ekheden, Y., Dusan, B., Brorstroem-Lunden, E. (2007). Results from the Swedish National Screening Programme 2006. Subreport 1: Phthalates. GRA and I(GRA and I):39.			
<b>HERO ID:</b>	675060			
<b>Conditions of Use:</b>	Use (general use, not differentiated)			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Area sampling data: See Table on pg 4/38, it appears that DIBP was only tested for in air on a limited basis and was not one of the 4 phthalates that were targeted by this study				
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	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/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	Low	Air concentrations are of ambient air, which may not be in scope for engineering
	Metric 4:	Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment 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. 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	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			Medium	

<b>Study Citation:</b>	EC/HC, (2015). State of the science report: Phthalate substance grouping: Medium-chain phthalate esters: Chemical Abstracts Service Registry Numbers: 84-61-7; 84-64-0; 84-69-5; 523-31-9; 5334-09-8;16883-83-3; 27215-22-1; 27987-25-3; 68515-40-2; 71888-89-6.		
<b>HERO ID:</b>	3688160		
<b>Conditions of Use:</b>	Ambient air concentration, indoor home air and dust concentrations		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Exposure route:	Oral exposure		
Physical form:	dust		
Area sampling data:	Ambient air concentration was 3.6 ng/m3 (median) and 18 ng/m3 (maximum) in North America (p. 87). Indoor air concentration was 0.017-1.7 ug/m3, 0.130 ug/m3 (median), and 0.370 ug/m3 (95th) in US homes (tab 9-1).		
Dermal exposure data:	Dermal exposure data		
<b>EVALUATION</b>			
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	Medium	The data are from an OECD country other than the U.S. (Canada).
	Metric 3: Applicability	Low	The assessment is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, such as a consumer DIY scenario that is similar to a worker scenario.
	Metric 4: Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 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	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	EC/HC, (2015). State of the science report: Phthalate substance grouping: Medium-chain phthalate esters: Chemical Abstracts Service Registry Numbers: 84-61-7; 84-64-0; 84-69-5; 523-31-9; 5334-09-8;16883-83-3; 27215-22-1; 27987-25-3; 68515-40-2; 71888-89-6.		
<b>HERO ID:</b>	3688160		
<b>Conditions of Use:</b>	All - dermal absorption		
EXTRACTION			
<b>Parameter</b>	<b>Data</b>		
Dermal exposure data:	Dermal exposure data		
Exposure duration:	1 hour/day to 4 hours/day		
Comments:	For DIBP specifically, the internal dose from dermal contact with these articles8 was estimated to be 0.58 to 4.92 μg/kg/day and 1.0 to 3.6 μg/kg/day for adults and children, respectively (Danish EPA 2011; Danish EPA 2010ab). The Danish EPA also estimated dermal exposure to DIBP from dermal contact with school bags, toy bags, pencil cases and erasers (range between 0.01 and 32.54 μg/kg/day, Danish EPA 2007). page 81. See table 9.3 and 9.4		
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	Medium	The data are from an OECD country other than the U.S. (Canada).
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment 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	

<b>Study Citation:</b>	EC/HC, (2017). Draft screening assessment: Phthalate substance grouping.			
<b>HERO ID:</b>	5353181			
<b>Conditions of Use:</b>	Plastic and rubber products not covered elsewhere			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	oral, inhalation, dermal			
Physical form:	dust			
Dermal exposure data:	Dermal exposure data			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Canada, an OECD country.
	Metric 3:	Applicability	Low	Data are for consumer use of plastic and rubber products, which is similar to the fabrication of final products from articles.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (means, medians, maximums, ranges) 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 including limits of detection and estimation methods in the appendix. Variability is addressed by compiling different studies in the report.
<b>Overall Quality Determination</b>			<b>High</b>	



<b>Study Citation:</b>	ECHA, (2012). Committee for Risk Assessment (RAC) Committee for Socio-economic Analysis (SEAC): Background document to the Opinion on the Annex XV dossier proposing restrictions on four phthalates.
<b>HERO ID:</b>	3661424
<b>Conditions of Use:</b>	Plastics

EXTRACTION	
Parameter	Data
Exposure route:	Workers can be exposed to the four phthalates during manufacturing of articles – not only due to direct “hands on” contact, but also due to the emissions from e.g. industrial extrusion processes or the presence of articles like e.g. PVC flooring at the production site. Other occupational exposures can come from different job situations in private households, nurseries, offices, hospitals, kindergardens etc.
Area sampling data:	Table 23 has steady state concentrations in indoor air: 6E-6 to 1E-5 ug/m3 depending on room of the house.
Dermal exposure data:	Dermal exposure data
Exposure duration:	See table 12 for dermal exposure duration for various plastic articles (non-occupational exposure)

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	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/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	Low	Exposure estimates are for non-occupational use of plastics.
	Metric 4:	Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 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	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.

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<b>Study Citation:</b> ECHA, (2012). Committee for Risk Assessment (RAC) Committee for Socio-economic Analysis (SEAC): Background document to the Opinion on the Annex XV dossier proposing restrictions on four phthalates.			
<b>HERO ID:</b> 3661424			
<b>Conditions of Use:</b> Plastics			
Domain		Metric	
		<b>EVALUATION</b>	
		Rating	
		Comments	
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	ECHA, (2009). Data on manufacture, import, export, uses and releases of dibutyl phthalate (DBP) as well as information on potential alternatives to its use.			
<b>HERO ID:</b>	6316858			
<b>Conditions of Use:</b>	All - dermal absorption			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Dermal exposure data:	nan			
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	Medium	The data are from an OECD country other than the U.S. (Europe).	
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.	
	Metric 5: Sample Size	Low	Information is qualitative.	
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.	
Overall Quality Determination		Medium		

<b>Study Citation:</b>	EPA,, Danish (2011). Annex XV restriction report: Proposal for a restriction, version 2. Substance name: bis(2-ehlylhexyl)phthlate (DEHP), benzyl butyl phthalate (BBP), dibutyl phthalate (DBP), diisobutyl phthalate (DIBP).			
<b>HERO ID:</b>	7265437			
<b>Conditions of Use:</b>	Plastics			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	Workers can be exposed to the four phthalates during manufacturing of articles – not only due to direct “hands on” contact, but also due to the emissions from e.g. industrial extrusion processes or the presence of articles like e.g. PVC flooring at the production site. Other occupational exposures can come from different job situations in private households, nurseries, offices, hospitals, kindergardens etc.			
Area sampling data:	Table 24 has steady state concentrations in indoor air: 6E-6 to 1E-5 ug/m3 depending on room of the house.			
Dermal exposure data:	Dermal exposure data			
Exposure duration:	See table 18 for dermal exposure duration for various plastic articles (non-occupational exposure)			
<b>EVALUATION</b>				
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	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/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	Low	Exposure information is non-occupational.
	Metric 4:	Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 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	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
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<b>Study Citation:</b> EPA,, Danish (2011). Annex XV restriction report: Proposal for a restriction, version 2. Substance name: bis(2-ehthylhexyl)phthlate (DEHP), benzyl butyl phthalate (BBP), dibutyl phthalate (DBP), diisobutyl phthalate (DIBP).			
<b>HERO ID:</b> 7265437			
<b>Conditions of Use:</b> Plastics			
Domain		Metric	
		<b>EVALUATION</b>	
		Rating	
		Comments	
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	Frery, N., Santonen, T., Porras, S. P., Fucic, A., Leso, V., Bousoumah, R., Duca, R. C., Yamani, El, M., Kolossa-Gehring, M., Ndaw, S., Viegas, S., Iavicoli, I. (2020). Biomonitoring of occupational exposure to phthalates: A systematic review. International Journal of Hygiene and Environmental Health 229:13548.
<b>HERO ID:</b>	7978498
<b>Conditions of Use:</b>	manufacturing, Processing - incorporation into Article, Processing – incorporation into formulation, mixture, or reaction product

**EXTRACTION**

Parameter	Data
Worker activity description:	Source contains a list of multiple references and contains a brief description of worker activities for each reference and include:manufacturing workersWorkers from 7 companies from different sectors - phthalatemanufacturing, PVC film, vehicle filters, PVC compounding, rubber hoses, rubber gaskets, and rubber bootsRubber workers employed in 9 different factories
Exposure route:	”Since phthalates usually have a low vapor pressure, inhalation is often not the dominant route of uptake; oral (e.g., hands-to-mouth transfer) and dermal routes can thus play an important role inthe total exposure.””Occupational exposure can take place by the dermal route (with low molecular weight phthalates such as DEP, DBP, and BBzP), by inhalation (with more volatile phthalates like DEP and DMP), or to a less extent, by ingestion (especially with the high molecular weight DEHP and DINP). Human data on uptake after inhalation exposure, ingestion, or dermal contact are generally limited.”
Personal sampling data:	Source contains a list of multiple references and contains a brief description of sampling results from each reference. Mostly presents health data such as urinary excretion sampling, metabolite concentrations, and other biomarkers, however, a few mention inhalation exposure is present.
Number of workers:	Source contains a list of multiple references and contains a number of sampled workers for each reference

**EVALUATION**

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from multiple countries and includes U.S. data as well as data from OECD countries.
	Metric 3: Applicability	High	Data are for manufacturing and multiple processing scenarios, which are in-scope occupational scenarios.
	Metric 4: Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Low	inhalation sample distribution is described qualitatively.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.

**Overall Quality Determination****Medium**

<b>Study Citation:</b>	Gao, C. J., Kannan, K. (2020). Phthalates, bisphenols, parabens, and triclocarban in feminine hygiene products from the United States and their implications for human exposure. Environment International 136:105465.			
<b>HERO ID:</b>	6957637			
<b>Conditions of Use:</b>	Use			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	dermal			
Physical form:	creams, powders, wipes, and cotton products like pads and tampons			
Dermal exposure data:	Dermal exposure data			
Comments:	Table 4 for exposure (dermal) assessment			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Low	Data are for consumer use of Personal care products, which is similar to the in-scope occupational scenario use of fabric products and textiles.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (means, medians, ranges) 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 in the limits of detection and sampling methodologies. Variability is addressed by sampling different products and product brands.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Guo, Y., Wang, L., Kannan, K. (2014). Phthalates and parabens in personal care products from China: Concentrations and human exposure. Archives of Environmental Contamination and Toxicology 66(1):113-119.			
<b>HERO ID:</b>	1987638			
<b>Conditions of Use:</b>	Personal care products			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	Dermal			
Physical form:	Liquid			
Dermal exposure data:	Dermal exposure data			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality [data/techniques/methods] from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for personal care products, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (max) but discrete samples not provided and distribution not fully characterized.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by testing multiple products but uncertainty is not addressed.	
<b>Overall Quality Determination</b>		<b>High</b>		



<b>Study Citation:</b>	Lee, M., Kim, J. H., Lee, D., Kim, J., Lim, H., Seo, J., Park, Y. K. (2018). Health risk assessment on hazardous ingredients in household deodorizing products. International Journal of Environmental Research and Public Health 15(4):744.		
<b>HERO ID:</b>	4730751		
<b>Conditions of Use:</b>	Use of deodorizing products		
EXTRACTION			
Parameter	Data		
Dermal exposure data:	Dermal exposure data		
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	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/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	Low	The assessment is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, such as a consumer DIY scenario that is similar to a worker scenario.
	Metric 4: Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 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	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

<b>Study Citation:</b>	OECD, (2011). Emission scenario document on coating application via spray-painting in the automotive refinishing industry.		
<b>HERO ID:</b>	3808976		
<b>Conditions of Use:</b>	Use		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Worker activity description:	transferring and mixing liquid products, container cleaning, transferring mixed coating to application equipment, overspray		
Exposure route:	dermal and inhalation. dermal: Provides methods for modeling exposures to non-volatile liquids Inhalation: Provides methods for modeling exposures to mists		
Physical form:	dermal: surrogate measured skin loading conditions inhalation: 8-hr TWA surrogate data		
Exposure frequency:	liquid		
Number of workers:	Exposure Frequency: 250 days/yr		
Personal protective equipment:	8 workers/site		
Comments:	air-purifying respirators or air-supplied respirators, Gloves (typically latex or nitrile), paint suits, and face masks/eye protection		
	PBZ samples		
<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>Medium</b>	

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

<b>Study Citation:</b>	OECD, (2013). Emission scenario document on the industrial use of adhesives for substrate bonding.		
<b>HERO ID:</b>	3827300		
<b>Conditions of Use:</b>	Commercial/Industrial Use - Adhesives and Sealants		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Worker activity description:	unloading, container cleaning, adhesive application, equipment cleaning, curing/drying		
Exposure route:	dermal and inhalation. dermal: Provides methods for modeling exposures to solids and non-volatile liquids Inhalation: Provides methods for modeling exposures to mists and volatile liquids		
Exposure frequency:	Exposure Frequency: 50-250 days/yr		
Number of workers:	26-106 workers/site		
Personal protective equipment:	chemical-resistant gloves and safety glasses. Heat-resistant gloves are used when applying hot-melt adhesives		
Engineering control:	Spray booths		
<b>EVALUATION</b>			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are reasonably expected to be representative of current industry conditions.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions, types of adhesives, and end use markets.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	OECD, (2015). Emission scenario document on use of adhesives.			
<b>HERO ID:</b>	3833136			
<b>Conditions of Use:</b>	Adhesive Application			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	unloading, container cleaning, adhesive application, equipment cleaning, curing/drying.			
Exposure route:	dermal and inhalation			
Personal sampling data:	Inhalation: Provides methods for modeling exposures to mists and volatile liquids.			
Dermal exposure data:	nan			
Exposure frequency:	50-250 days/yr			
Number of workers:	26-106 workers/site.			
Personal protective equipment:	chemical-resistant gloves and safety glasses. Heat-resistant gloves are used when applying hot-melt adhesives.			
Engineering control:	Spray booths			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions, types of adhesives, and end use markets.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	OECD, (2010). Emission scenario document on formulation of radiation curable coatings, inks and adhesives.			
<b>HERO ID:</b>	3840003			
<b>Conditions of Use:</b>	Processing - Paints, Coatings, and Adhesives			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	Unloading, container cleaning, sampling, equipment cleaning, filter media changeout, packaging			
Exposure route:	dermal and inhalation. dermal: Provides methods for modeling exposures to both solids and non-volatile liquids Inhalation: Provides methods for modeling exposures to both solids and volatile liquids			
Exposure frequency:	Exposure frequency: 250 days/yr			
Number of workers:	18-39 workers/site			
Personal protective equipment:	fabric or non-woven long sleeved shirts and pants, coveralls, and neoprene or rubber gloves. Barrier creams may be used to facilitate hand washing when materials or products penetrate gloves or other PPE. A rubber apron or rubber suit and rubber boots may also be worn in cases where there is potential for splashing on or penetration through clothing			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.	
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions and types of UV curable products.	
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	OECD, (2011). Emission Scenario Document on the application of radiation curable coatings, inks, and adhesives via spray, vacuum, roll, and curtain coating.		
<b>HERO ID:</b>	6568745		
<b>Conditions of Use:</b>	Application of Adhesives and Sealants		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Worker activity description:	unloading, container cleaning, sampling, application, equipment cleaning.		
Exposure route:	dermal and inhalation		
Personal sampling data:	Inhalation: Provides methods for modeling exposures to mists and volatile liquids.		
Dermal exposure data:	nan		
Exposure frequency:	250 days/yr		
Number of workers:	7-85 workers/site		
Personal protective equipment:	fabric or non-woven long sleeved shirts and pants, coveralls, and neoprene or rubber gloves. Barrier creams may be used to facilitate hand washing when materials or products penetrate gloves or other PPE. A rubber apron or rubber suit and rubber boots may also be worn in cases where there is potential for splashing on or penetration through clothing. Respiratory protection is used when necessary, especially when escape of spray particles into the work environment is unavoidable.		
Engineering control:	Spray booths		
<b>EVALUATION</b>			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data.
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions and types of UV curable products.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	Porras, S. P., Koponen, J., Hartonen, M., Kiviranta, H., Santonen, T. (2020). Non-occupational exposure to phthalates in Finland. Toxicology Letters 332:107-117.		
<b>HERO ID:</b>	6957499		
<b>Conditions of Use:</b>	non-occupational; general population		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Exposure route:	Overall exposure ( determined through urine samples)		
Number of workers:	60 occupationally non-exposed volunteers from the Helsinki (n = 44), Kuopio (n = 9) and Tampere (n= 7) regions		
Comments:	assess phthalate		
<b>EVALUATION</b>			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Finland, an OECD country.
	Metric 3: Applicability	Low	The assessment is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation
	Metric 4: Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5: Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The assessment addresses variability and uncertainty in the results.
<b>Overall Quality Determination</b>		<b>Medium</b>	



<b>Study Citation:</b>	Pronk, J., M.E., Woutersen, M., Herremans, M., J.M. (2020). Synthetic turf pitches with rubber granulate infill: are there health risks for people playing sports on such pitches?. Journal of Exposure Science & Environmental Epidemiology 30(3):567-584.		
<b>HERO ID:</b>	5043594		
<b>Conditions of Use:</b>	Use of synthetic rubber turf pitches for sports		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Exposure route:	For children and adults playing amateur football, exposure scenarios were developed to estimate their potential exposure to substances in rubber granulate via the oral (through accidental ingestion), dermal (through skin contact) and inhalation route (through inhalation of vapours or rubber dust) (p. 5). The results show that the oral route is the most important exposure route for PAHs and phthalates in rubber granulate (p. 9).		
Personal sampling data:	See Table 2 - Assumed rubber dust concentrations of 12 ug/m3		
Dermal exposure data:	Dermal exposure data		
Exposure duration:	See Table 2 - assumed exposure durations of 1, 1.5, and 2 hrs/event		
Exposure frequency:	See Table 2 - Assumed frequency of 2-5 times/week over 7 or 10 months/yr.		
Comments:	Table 4 Maximum concentrations and migration levels (in bold) per pitch used for exposure assessment		
<b>EVALUATION</b>			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Article is peer reviewed and the model appears to be free of mathematical errors and is based on scientifically sound approaches or methods.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from the Netherlands, an OECD country.
	Metric 3: Applicability	High	The assessment can be appropriately applied to an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	The journal article with the model was published in 2018, which is less than 10 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, andassumptions
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The assessment addresses variability and uncertainty in the results
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	Science Applications International Corporation, (1996). Generic scenario for automobile spray coating: Draft report.		
<b>HERO ID:</b>	6311222		
<b>Conditions of Use:</b>	Automotive Coating Application		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Worker activity description:	Auto OEM: robotics operations, paint mixing, paint booth cleaning, inspection, and manual "touch-up" painting. Autorefinish: 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		
Personal sampling data:	Provides methods for modeling exposures to mists		
Dermal exposure data:	Dermal exposure data		
Exposure frequency:	Auto OEM: 250 days/yr. Autorefinish: 170 days/yr.		
Number of workers:	Auto OEM: 17 workers/site. Autorefinish: 4-10 workers/site.		
Engineering control:	Spray booths		
<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	U.S. EPA, (2021). Use of additives in plastic compounding – Generic scenario for estimating occupational exposures and environmental releases (Revised draft).			
<b>HERO ID:</b>	10366192			
<b>Conditions of Use:</b>	Plastics Compounding			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	Unloading and charging additives to process, container cleaning, equipment cleaning, and compounding processes.			
Exposure route:	dermal and inhalation			
Personal sampling data:	Inhalation: Provides methods for modeling exposures to both solids and volatile liquids.			
Dermal exposure data:	Dermal exposure data			
Exposure frequency:	148-264 days/yr			
Number of workers:	24 workers/site			
Engineering control:	Forced ventilation			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data.
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Low	Model results characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic types, additive types, and worker activities.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	U.S. EPA, (2023). Use of laboratory chemicals - Generic scenario for estimating occupational exposures and environmental releases (Revised draft generic scenario).			
<b>HERO ID:</b>	10480466			
<b>Conditions of Use:</b>	Use - Laboratory Chemicals			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	Container unloading (liquids and solids), container cleaning, equipment cleaning, laboratory analyses, disposal of laboratory chemicals			
Exposure route:	Dermal, Inhalation; dermal: Provides methods for modeling exposures to non-volatile and volatile liquids and solidsInhalation: Provides methods for modeling exposures to non-volatile and volatile liquids and solids			
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			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>			<b>High</b>	

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

<b>Study Citation:</b>	U.S. EPA, (2021). Use of chemicals in fuels and related products - Generic scenario for estimating occupational exposures and environmental releases (Methodology review draft).			
<b>HERO ID:</b>	11203977			
<b>Conditions of Use:</b>	Fuels and Fuel Additives			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	Unloading transport containers, cleaning transport containers, equipment cleaning, fuel combustion exposures.			
Exposure route:	Dermal, Inhalation			
Physical form:	Liquid			
Area sampling data:	Inhalation: Provides methods for modeling exposures to volatile liquids. Also provides PBZ data reported in literature.			
Dermal exposure data:	Dermal exposure data			
Exposure duration:	8 hr/day.			
Exposure frequency:	250 days/yr.			
Number of workers:	1 worker/site.			
Personal protective equipment:	Respiratory protection.			
Engineering control:	Routine maintenance, engine filters, avoiding idling, exhaust vents.			
<b>EVALUATION</b>				
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	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	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 exposure to multiple fuel and additive types, and considering different worker activities.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	U.S. EPA, (2021). Use of additives in plastics converting – Generic scenario for estimating occupational exposures and environmental releases (revised draft).			
<b>HERO ID:</b>	11373493			
<b>Conditions of Use:</b>	Plastics Converting			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	Unloading and charging compounded resins to process, converting processes, converting equipment cleaning, trimming processes.			
Exposure route:	dermal and inhalation			
Personal sampling data:	Inhalation: Provides methods for modeling exposures to both solids and volatile liquids.			
Dermal exposure data:	nan			
Exposure frequency:	137-254 days/yr			
Number of workers:	30-69 workers/site			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data.
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Low	Model results characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic types, additive types, and worker activities.
Overall Quality Determination		Medium		

<b>Study Citation:</b>	U.S. EPA, (2024). Emission Scenario Document on fluorocarbon substitutes in blowing agents for manufacture of rigid and flexible foam (draft).			
<b>HERO ID:</b>	12197147			
<b>Conditions of Use:</b>	Manufacture of Polyurethane Foam for Pipeline Pigs			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	Inhalation of DIBP-containing dusts or dermal contact with solids during foam trimming activities. Dermal exposure to liquids during equipment and container cleaning. Dermal contact with liquids and inhalation of vapors during the unloading of DIBP, equipment cleaning, and container cleaning (p. 5-1).			
Exposure duration:	249 days/yr (p. 5-3)			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	This document is an OECD ESD, a frequently used source.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was published by EPA, so it is US-based.	
	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	ESD is from 2024, less than 10 years old.	
	Metric 5: Sample Size	Medium	ESD provides an average and median of operating days, but no discrete data used in calculating this value.	
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 is addressed in presenting different NAICS codes data, and in addressing different physical forms of exposure. Uncertainty isn’t addressed.	
<b>Overall Quality Determination</b>		<b>High</b>		



<b>Study Citation:</b>	U.S. EPA, (2014). Generic scenario draft on the use of additives in plastic compounding.			
<b>HERO ID:</b>	3827195			
<b>Conditions of Use:</b>	Plastics Compounding			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	Unloading and charging additives to process, container cleaning, equipment cleaning, and compounding processes			
Exposure route:	dermal and inhalation			
Personal sampling data:	Provides methods for modeling exposures to both solids and volatile liquids			
Dermal exposure data:	nan			
Exposure frequency:	148-264 days/yr			
Number of workers:	24 workers/site			
Engineering control:	Forced ventilation			
Comments:	See Table 3.2 for Number of Workers, Worker Hours, and Worker Days for Plastics Compounding Facilities.			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Low	Model results characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic and additive types.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	U.S. EPA, (2014). Formulation of waterborne coatings - Generic scenario for estimating occupational exposures and environmental releases -Draft.		
<b>HERO ID:</b>	3827197		
<b>Conditions of Use:</b>	Formulation of Coatings		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Worker activity description:	Unloading, container cleaning, sampling, equipment cleaning, filter media changeout, packaging.		
Exposure route:	Dermal and inhalation.		
Personal sampling data:	Inhalation: Provides methods for modeling exposures to volatile liquids and solids		
Dermal exposure data:	nan		
Exposure frequency:	235-350 days/yr.		
Number of workers:	25-40 workers/site.		
Personal protective equipment:	PPE depends on the type of potential exposure. Typically, PPE used in the workplace include safety glasses and gloves. Face shields and a particulate respirator may also be required in cases where there is a potential for dust exposure.		
<b>EVALUATION</b>			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data.
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple coating applications, and multiple chemical functions.
<b>Overall Quality Determination</b>		<b>High</b>	

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

<b>Study Citation:</b>	U.S. EPA, (2004). Additives in plastics processing (compounding) – generic scenario for estimating occupational exposures and environmental release – Draft.
<b>HERO ID:</b>	6311218
<b>Conditions of Use:</b>	incorporation into article as a plasticizer in plastic product manufacturing; incorporation into formulation, mixture, or reaction product as a plasticizer in plastic product manufacturing

EXTRACTION	
Parameter	Data
Worker activity description:	Unloading and charging additives to process, container cleaning, equipment cleaning, and compounding processes
Exposure route:	dermal and inhalation
Personal sampling data:	Inhalation: Provides methods for modeling exposures to both solids and volatile liquids
Dermal exposure data:	Dermal exposure data
Exposure duration:	8 hr/day
Exposure frequency:	250 days/yr
Number of workers:	24 workers/site
Engineering control:	'Forced ventilation
Comments:	QC Note: This is an early draft of the Plastic Compounding GS and may not provide the most up to data info

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

<b>Overall Quality Determination</b>	<b>Medium</b>
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<b>Study Citation:</b>	U.S. EPA, (2001). Manufacture and use of printing ink - Generic scenario for estimating occupational exposures and environmental releases (revised draft).			
<b>HERO ID:</b>	6311221			
<b>Conditions of Use:</b>	Formulation and Use of Printing Inks			
EXTRACTION				
Parameter	Data			
Worker activity description:	PROC: unloading, cleaning, packagingUSE: Printing operations, unloading			
Exposure route:	dermal and inhalation			
Personal sampling data:	PROC: Inhalation: Provides methods for modeling exposures to volatile liquids and solidsUSE: Inhalation: Provides methods for modeling exposures to volatile liquids and solids			
Dermal exposure data:	Dermal exposure data			
Exposure frequency:	PROC: 250 days/yrUSE: 250 days/yr			
Number of workers:	PROC: 13-22 workers/siteUSE: 16-43 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	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 printing applications, and multiple chemical functions
Overall Quality Determination			Medium	

<b>Study Citation:</b>	U.S. EPA, (1999). Flexographic printing - generic scenario for estimating occupational exposures and environmental releases: Draft.			
<b>HERO ID:</b>	6385709			
<b>Conditions of Use:</b>	Flexographic Printing			
EXTRACTION				
Parameter	Data			
Worker activity description:	Transferring and mixing inks, adjusting ink cans at the press, operating the press.			
Exposure route:	dermal and inhalation.			
Area sampling data:	Inhalation: Provides methods for modeling exposures to volatile liquids.			
Dermal exposure data:	Dermal exposure data			
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	

<b>Study Citation:</b>	U.S. EPA, (2010). Manufacture and use of printing inks - generic scenario for estimating occupational exposures and environmental releases: Draft.			
<b>HERO ID:</b>	6385710			
<b>Conditions of Use:</b>	Formulation and Use of Printing Inks			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	PROC: Unloading, formulation (dispersion and milling), equipment cleaning, packaging. Workers are likely to encounter both inhalation and dermal exposure during handling of raw materials and ink products as well as equipment cleaning.USE: Unloading, printing operations and ink drying, equipment cleaning. 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.			
Exposure route:	Inhalation and dermal			
Physical form:	PROC: Liquid, solid particulateUSE: Liquid, mist			
Number of workers:	See Table 2-2: Total number of workers is 64,973, with the number of workers for each printing type varying from ~13,000 to ~225,000			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Medium	The GS is more than 10 years but no more 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	Uncertainty not addressed. Variability not addressed.	
<b>Overall Quality Determination</b>		<b>Medium</b>		

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



<b>Study Citation:</b>	U.S. EPA, (2004). Spray coatings in the furniture industry - generic scenario for estimating occupational exposures and environmental releases: Draft.			
<b>HERO ID:</b>	6385719			
<b>Conditions of Use:</b>	Furniture Coating Application			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	unloading, spray application, equipment cleaning.			
Exposure route:	dermal and inhalation			
Personal sampling data:	Inhalation: Provides methods for modeling exposures to mists and volatile liquids.			
Dermal exposure data:	Dermal exposure data			
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			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	U.S. EPA, (1994). Fabric finishing - generic scenario for estimating occupational exposures and environmental releases: Draft.			
<b>HERO ID:</b>	6385741			
<b>Conditions of Use:</b>	Processing: Fabric, textile, and leather products			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	mixing			
Exposure route:	Dermal and inhalation. Inhalation is negligible.			
Physical form:	Concentrated solutions or waxy solids			
Dermal exposure data:	Dermal exposure data			
Number of workers:	3-6 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	Medium	Distribution of samples is 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 finishing agent types
Overall Quality Determination		Medium		

<b>Study Citation:</b>	U.S. EPA, (2014). Use of additive in plastic compounding - generic scenario for estimating occupational exposures and environmental releases: Draft.			
<b>HERO ID:</b>	6385748			
<b>Conditions of Use:</b>	Processing - Additive in Plastic Compounding			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	Unloading and charging additives to process, container cleaning, equipment cleaning, and compounding processes			
Exposure route:	dermal and inhalation. dermal: Provides methods for modeling exposures to both solids and non-volatile liquids Inhalation: Provides methods for modeling exposures to both solids and volatile liquids			
Exposure frequency:	Exposure Frequency: 148-264 days/yr			
Number of workers:	24 workers/site			
Engineering control:	Forced ventilation			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic types, additive types, and worker activities.
<b>Overall Quality Determination</b>			<b>High</b>	

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

**EXTRACTION**

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

**EVALUATION**

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment uses high quality data that are from a frequently used source and are generally accepted by the scientific community, and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The assessment is for an occupational scenario within the scope of the risk evaluation. However, data are not chemical specific.
	Metric 3: Applicability	Medium	The assessment is for an occupational scenario within the scope of the risk evaluation. However, data are not chemical specific.
	Metric 4: Temporal Representativeness	Low	Data are greater than 20 years old.
	Metric 5: Sample Size	N/A	Sample size criteria are not applicable to data extracted.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.

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Study Citation:	U.S. EPA, (2004). Additives in plastics processing (converting into finished products) -generic scenario for estimating occupational exposures and environmental releases. Draft.		
HERO ID:	6549571		
Conditions of Use:	Additives in Plastics Processing (Converting into Finished Products)		
Domain	Metric	EVALUATION Rating	Comments
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability in worker activities is captured through identification of various NAICS codes associated with plastic additive use, but uncertainty associated with number of workers is not characterized.
Overall Quality Determination		Medium	

<b>Study Citation:</b>	U.S. EPA, (1992). Generic scenario document for lube oil additives.			
<b>HERO ID:</b>	8726954			
<b>Conditions of Use:</b>	Manufacture			
EXTRACTION				
Parameter	Data			
Worker activity description:	transfer of additive at 100% concentration			
Exposure route:	inhalation and dermal			
Personal sampling data:	Inhalation: negligible due to low vapor pressure			
Dermal exposure data:	Dermal exposure data			
Exposure frequency:	250 days/year			
Number of workers:	45; assume 50% of workers are exposed.			
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	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	Uncertainty not addressed. Variability addressed by considering multiple additive types and worker activities.	
Overall Quality Determination		Medium		

<b>Study Citation:</b>	U.S. EPA, (1992). Generic scenario document for lube oil additives.			
<b>HERO ID:</b>	8726954			
<b>Conditions of Use:</b>	incorporation into formulation, mixture, or reaction product as a fuel additive			
EXTRACTION				
Parameter	Data			
Worker activity description:	transfer of additive at 10% concentration			
Exposure route:	dermal			
Personal sampling data:	negligible due to low vapor pressure			
Dermal exposure data:	Dermal exposure data			
Exposure frequency:	250 days/yr			
Number of workers:	45 workers per site, assume 50% of workers are dermally exposed			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	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	Report is based on data greater than 20 years old (1992) and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Low	Model results 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	Uncertainty not addressed. Variability addressed by considering multiple additive types.
Overall Quality Determination		Medium		

<b>Study Citation:</b>	U.S. EPA, (1992). Generic scenario document for lube oil additives.			
<b>HERO ID:</b>	8726954			
<b>Conditions of Use:</b>	Use as a fuel additive			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	routine emersion into lube			
Exposure route:	dermal			
Personal sampling data:	inhalation exposure negligible due to low vapor pressure			
Dermal exposure data:	Dermal exposure data			
Exposure frequency:	Pure lube: 250 days/yearGeneral Automotive: 250 days/year			
Number of workers:	Pure lube: 190 workersGeneral Automotive: 1,851 workers exposed			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	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	Report is based on data greater than 20 years old (1992) and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	Low	Model results characterized by no statistics.	
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	Medium	Uncertainty not addressed. Variability addressed by considering multiple additive types.	
<b>Overall Quality Determination</b>		<b>Medium</b>		



<b>Study Citation:</b>	Akzo Nobel Polymer Chemicals (2008). Butanox LPT.			
<b>HERO ID:</b>	6302635			
<b>Conditions of Use:</b>	Adhesives and Sealants			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Physical form:	Clear and colorless liquid.			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for adhesives and sealants, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	N/A	N/A - Physical form.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - Physical form.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Azon, (2017). Safety Data Sheet (SDS): Azo-Cat 25.			
<b>HERO ID:</b>	11799639			
<b>Conditions of Use:</b>	Use of Adhesives and Sealants			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Personal protective equipment:	PDF Pg. 6Safety eyewear, chemical splash goggles and/or faceshield, full-face respirator, chemical-resistant impervious gloves.			
Engineering control:	PDF Pg. 6Process enclosures, local exhaust ventilation.			
<b>EVALUATION</b>				
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 use of adhesives and sealants, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	N/A	N/A - PPE and engineering controls.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - PPE and engineering controls.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Bao, J., Wang, M., Ning, X., Zhou, Y., He, Y., Yang, J., Gao, X., Li, S., Ding, Z., Chen, B. (2015). Phthalate concentrations in personal care products and the cumulative exposure to female adults and infants in Shanghai. Journal of Toxicology and Environmental Health, Part A: Current Issues 78(5):325-341.			
<b>HERO ID:</b>	2816857			
<b>Conditions of Use:</b>	Use of Personal care products			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Dermal exposure data:	nan			
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	Low	The data are from a non-OECD country, and locality-specific factors (e.g., potentially greater differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S., or the country of origin is not specified.
	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	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	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	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		Uninformative		

<b>Study Citation:</b>	Canada,, G.o. (2020). Phthalate substance grouping – Information sheet.			
<b>HERO ID:</b>	7349060			
<b>Conditions of Use:</b>	General population exposure			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	Canadians may be exposed to these substances from food, including breast milk, environmental sources (for example, dust and for certain phthalates, indoor air), and contact with plastic items. Canadians may also be exposed to some of these substances as a result of using certain cosmetics and natural health care products (for example, diaper creams, body lotions, and hairsprays). Exposure to DIBP and DINP may also occur from the use of certain plastic toys and children’s articles (for example, from mouthing these objects). (p. 4).			
<b>EVALUATION</b>				
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	Report is from Canada.	
	Metric 3: Applicability	Low	The report is for a non-occupational scenario that is similar to 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	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.	
<b>Overall Quality Determination</b>		<b>Low</b>		

<b>Study Citation:</b>	CDC, (2009). Fourth national report on human exposure to environmental chemicals.			
<b>HERO ID:</b>	664488			
<b>Conditions of Use:</b>	Use of consumer articles			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	People are exposed through ingestion, inhalation, and, to a lesser extent, dermal contact with products that contain phthalates. workers may be exposed to higher air phthalate concentrations than the general population.			
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	Low	The report is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, such as a consumer DIY scenario that is similar to a worker scenario.
	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 generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Low	Information is qualitative
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			Medium	

<b>Study Citation:</b>	ESIG, (2012). SPERC fact sheet – Manufacture of substance – Industrial (Solvent-borne).			
<b>HERO ID:</b>	11373487			
<b>Conditions of Use:</b>	Manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Engineering control:	Thermal wet scrubber – gas removal and/or air filtration – particle removal and/or thermal oxidation and/or vapour recovery – adsorption.			
<b>EVALUATION</b>				
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 is from Europe.
	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 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 - Engineering controls.
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 - Engineering controls.
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	Gaspar, F. W., Castorina, R., Maddalena, R. L., Nishioka, M. G., Mckone, T. E., Bradman, A. (2014). Phthalate exposure and risk assessment in California child care facilities. Environmental Science & Technology 48(13):7593-7601.			
<b>HERO ID:</b>	2345959			
<b>Conditions of Use:</b>	commercial use			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	Workers at California child-care facilities - 28 child care centers and 12 home-based facilities			
Exposure route:	Inhalation, ingestion, and dermal			
Physical form:	gas, as small particulates that cab present as dust			
Personal sampling data:	no information provided			
Area sampling data:	Concentration of DIBP in dust (ug/g): GM – 10.6, GSD – 2.2, min – 3.5, max – 145.8. Concentration of DIBP in indoor air (ug/m3): >MDL – 87.5%, GM – 0.07, GSD – 5.52. max – 2.56.			
Exposure duration:	Approximately 22, 41, and 37% of children spent <5 h, 5–8 h, and >8 h per day			
Exposure frequency:	5 days per week and 48 weeks per year			
Engineering control:	Common strategies for reducing indoor pollutant concentrations include increasing fresh air ventilation or reducing the pollutant source			
<b>EVALUATION</b>				
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
	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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Giuliani, A., Zuccarini, M., Cichelli, A., Khan, H., Reale, M. (2020). Critical Review on the Presence of Phthalates in Food and Evidence of Their Biological Impact. International Journal of Environmental Research and Public Health 17(16):1-43.			
<b>HERO ID:</b>	8338316			
<b>Conditions of Use:</b>	May apply to more than 1 COU			
EXTRACTION				
Parameter		Data		
Physical form:		DIBP and DBP are abundant in the gas phase		
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	Primary authors are from Italy - an OECD country.
	Metric 3:	Applicability	Medium	Information may apply to more than 1 COU.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	N/A	Information is qualitative, no quantitative support was cited.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents its assessment methods, results, and assumptions but data sources for extracted data(i.e., exists in gas phase) are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	No scope to address variability and uncertainty.
Overall Quality Determination			High	



<b>Study Citation:</b>	Giulivo, M., Alda, L.d., M., Capri, E., Barceló, D. (2016). Human exposure to endocrine disrupting compounds: Their role in reproductive systems, metabolic syndrome and breast cancer. A review. Environmental Research 151:251-264.			
<b>HERO ID:</b>	3469349			
<b>Conditions of Use:</b>	General population exposure			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Area sampling data: Comments:	Table 1: 3.44-106 ng/g total PHTs in indoor dust; 1.246-839 ng/m3 total PHTs in indoor air General population			
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., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	Low	A non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, such as a consumer DIY scenario that is similar to a worker scenario.
	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	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	Datasources 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			Medium	

<b>Study Citation:</b>	Grace, (2022). Di-isobutyl phthalate (DIBP) use (sanitized).			
<b>HERO ID:</b>	11589992			
<b>Conditions of Use:</b>	Incorporation into formulation, mixture, or reaction product			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Personal protective equipment:	PDF Pg. 2”The PPE when pumping drums of DIBP or at other times when exposure is likely are a slicker suit, goggles, face shield, respirator, and chemical gloves.”			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data/techniques/methods that are not from frequently-used sources and there are no known quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for incorporation into formulation, mixture, or reaction product, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	N/A	N/A - PPE description.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A - PPE Description.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	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.
<b>HERO ID:</b>	6558536
<b>Conditions of Use:</b>	commercial use - spray painting

EXTRACTION	
Parameter	Data
Worker activity description:	Autobody shop. Before the cars are painted, structural damage to the cars is repaired elsewhere in the shop. This involves the repair and replacement of damaged parts. During these activities, the workers may be exposed to aerosols from sanding, grinding, and welding. For some jobs, abrasive blasting with sand that contains crystalline silica is used for paint removal. This abrasive blasting was conducted in the open. After the cars have been repaired, they are brought to the paint shop that is shown in the article. There is some sanding of areas to be painted. Parts of the car which are not to be painted are protected with masking. The car and autobody parts are painted in either the spray painting booth or in the vehicle preparation station. Generally, the vehicle preparation station is used only for small paint jobs or for primer painting. Both the vehicle preparation station and the spray painting booth were manufactured by Garbat Inc. Vehicle prep station shown in article how two bays. Bays are separated by moveable cloth curtains that were suspended from rods in the ceiling. Each bay exhausts air through 3 filters in the back of the vehicle preparation station. Spray painting booths have 2 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 cfm 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. Booth is 23 ft long, 13 ft wide and 9 ft high. Air is exhausted through a 2 ft wide, rectangular slot in the floor that is 17 ft by 6 ft. After the car or body part has been painted, the worker leaves the booth and the paint is cured at a temp 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.
Number of workers:	7
Personal protective equipment:	Half-facepiece, air-purifying respirators are used to control worker exposure to airborne particles during some sanding and welding operations. During abrasive blasting operations with crystalline-silica containing sand, a positive pressure air-supplied, half-facepiece respirator is used. At the time, OSHA respiratory practice standards is not being completely followed.
Engineering control:	Air flow measurements on Spray Painting Booths - airflow into entry duct: 8200 cfm; airflow from top of booth: 13000 cfm; airflow from bottom of booth: 11400 cfm; airflow at exhaust stack: 11600 cfm; leakage into exhaust air plenum: 1300 cfm; recirculation around damper: 750 cfm. Employees required to wear respirators when operating with spray paint operations as well as sanding, grinding, and welding.

EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Study conducted by NIOSH.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States
	Metric 3: Applicability	Low	Data is likely for an in-scope of use which is paints and coatings, however the study does not mention DIBP or phthalates in this source.
	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	Low	No metadata for DIBP.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.

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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:	commercial use - spray painting		
Domain	Metric	EVALUATION Rating	Comments
Overall Quality Determination		Low	

<b>Study Citation:</b>	Inc, A.U. (2015). Azo-Grout 443 Safety Data Sheet.			
<b>HERO ID:</b>	6302645			
<b>Conditions of Use:</b>	Adhesives and sealants			
		<b>EXTRACTION</b>		
<b>Parameter</b>	<b>Data</b>			
Physical form:	Liquid			
		<b>EVALUATION</b>		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2015, which is less than 10 years old.
	Metric 5:	Sample Size	N/A	N/A - Physical form.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides physical form and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - Physical form.
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	Langer, S., Weschler, C. J., Fischer, A., Bekö, G., Toftum, J., Clausen, G. (2010). Phthalate and PAH concentrations in dust collected from Danish homes and daycare centers. Atmospheric Environment 44(19):2294-2301.			
<b>HERO ID:</b>	1007791			
<b>Conditions of Use:</b>	Dust samples from daycare centers and bedrooms			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	The mass-fraction of an SVOC in settled dust provides information on its anticipated concentration in other indoor compartments and can be used to estimate human exposure via multiple pathways including inhalation, ingestion and dermal sorption.			
Physical form:	Solid - dust on surfaces			
Dermal exposure data:	Dermal exposure data			
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	Low	The condition of use is out of scope but the information may be used for an occupational scenario which is in scope.
	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. 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	Variability is addressed by taking samples from different locations but uncertainty is not addressed.
Overall Quality Determination		Medium		

<b>Study Citation:</b>		LLC, A.F. (2015). Material safety data sheet: CP310 Fire rated acrylic intumescent caulk.					
<b>HERO ID:</b>		6302619					
<b>Conditions of Use:</b>		Adhesives and Sealants					
		<b>EXTRACTION</b>					
<b>Parameter</b>		<b>Data</b>					
Physical form:		Red or white paste.					
		<b>EVALUATION</b>					
Domain		Metric		Rating		Comments	
Domain 1: Reliability		Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.		
Domain 2: Representativeness		Metric 2:	Geographic Scope	High	Product is from a US supplier.		
		Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.		
		Metric 4:	Temporal Representativeness	High	Source is from 2015, which is less than 10 years old.		
		Metric 5:	Sample Size	N/A	N/A - physical form.		
Domain 3: Accessibility/ Clarity		Metric 6:	Metadata Completeness	Low	Source just provides physical form and does not document how this value was obtained.		
Domain 4: Variability and Uncertainty		Metric 7:	Metadata Completeness	Medium	N/A - physical form.		
<b>Overall Quality Determination</b>				<b>High</b>			

<b>Study Citation:</b>	Lu, X., Xu, X., Lin, Y., Zhang, Y., Huo, X. (2018). Phthalate exposure as a risk factor for hypertension. Environmental Science and Pollution Research 25(21):20550-20561.		
<b>HERO ID:</b>	4728432		
<b>Conditions of Use:</b>	Use of plastic products		
EXTRACTION			
<b>Parameter</b>	<b>Data</b>		
Exposure route:	Populations are exposed to environmental phthalates from routes of ingestion, inhalation, derma, and intravenous contact throughout life, including intrauterine development.		
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	Low	The data are from a non-OECD country, and locality-specific factors (e.g., potentially greater differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S., or the country of origin is not specified.
	Metric 3: Applicability	Low	The report is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, such as a consumer DIY scenario that is similar to a worker scenario.
	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	Low	Information is qualitative
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		Medium	



<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	3222353			
<b>Conditions of Use:</b>	May apply to multiple COUs			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	oral via dermal			
Physical form:	liquids and powders			
Dermal exposure data:	Dermal exposure data			
Comments:	Study is on inadvertent oral exposure via dermal exposure pathway(i.e., hand to mouth contact). Other tables: TABLE III. Estimated Olive Oil Transfer Efficiencies (TE); TABLE V. Data Summary from Task 2: Experiments of Direct and Indirect Glove and Hand-To-Mouth Transfer; TABLE VI. Data Summary from Task 4: Experiments Involving Wiping the Perioral Area with the Arm or a Cotton Sleeve			
<b>EVALUATION</b>				
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. NIOSH 7903 and OSHA ID121 methods used. Published article.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country, UK.
	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. Not specific to DIBP.
	Metric 4:	Temporal Representativeness	High	No more than 10 years old (Published in 2014).
	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 results, methods, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The report addresses variability and uncertainty in the results.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	NICNAS, (2016). C4-6 side chain transitional phthalates: Human health tier II assessment.		
<b>HERO ID:</b>	5155535		
<b>Conditions of Use:</b>	manufacturing; processing;		
EXTRACTION			
Parameter	Data		
Worker activity description:	During product formulation, dermal and inhalational exposure of workers to the chemicals may occur, particularly where manual or open processes are used. These may include transfer and blending activities, quality control analysis, and cleaning and maintenance of equipment. Worker exposure to the chemicals at lower concentrations may also occur while using formulated products containing the chemicals. The level and route of exposure will vary depending on the method of application and work practices employed.		
Exposure route:	inhalation		
Comments:	Exposure standards. STEL in Sweden: 5 mg/m^3; Ireland and New Zealand set limits on TWA at 5 mg/m^3, Iceland’s is 3 mg/m^3; LTEL in UK is 5 mg/m^3		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data and sound methods that do not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data is for various OECD countries.
	Metric 3: Applicability	Medium	Report contains information that could be applied for occupational scenarios but does not identify any specific scenarios.
	Metric 4: Temporal Representativeness	High	Data is less than 10 years old
	Metric 5: Sample Size	Low	Characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Report clearly documents results, methods, and assumptions. Sources generally described
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Addresses variability across different countries, does not address uncertainty.
Overall Quality Determination		Medium	

<b>Study Citation:</b>	Pak, V. M., Mccauley, L. A. (2007). Risks of phthalate exposure among the general population: Implications for occupational health nurses. American Association of Occupational Health Nurses Journal 55(1):12-17.			
<b>HERO ID:</b>	1598544			
<b>Conditions of Use:</b>	Personal Care Products			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Worker activity description:	nail and hair salon workers			
Exposure route:	ingestion, inhalation, dermal			
Number of workers:	407000 people employed in beauty salons around the country			
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	Medium	Data are for commercial use of personal care products, which is similar to the in-scope occupational scenario commercial use of paints and coatings.
	Metric 4:	Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	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	

<b>Study Citation:</b>	Phenova (2017). Custom 8061 Phthalates Mix Safety Data Sheet.				
<b>HERO ID:</b>	6301564				
<b>Conditions of Use:</b>	Laboratory Chemicals				
<b>EXTRACTION</b>					
<b>Parameter</b>	<b>Data</b>				
Physical form:	Liquid				
<b>EVALUATION</b>					
Domain	Metric		Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.	
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.	
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.	
	Metric 4:	Temporal Representativeness	High	Source is from 2017, which is less than 10 years old.	
	Metric 5:	Sample Size	N/A	N/A - physical form.	
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides physical form and does not document how this value was obtained.	
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - physical form.	
<b>Overall Quality Determination</b>			<b>High</b>		

<b>Study Citation:</b>	programs, E.O. (1974). Air pollution control engineering and cost study of the paint and varnish industry.			
<b>HERO ID:</b>	6580284			
<b>Conditions of Use:</b>	Formulation of paint and varnish			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Number of workers:	This Bureau of Census publication lists the number of plants in various size ranges such as 1 to 3 employees, 4 to 7 employees, etc. The total number of employees in any plant size can also be computed and expressed as a percentage of total employment in the Paint and Varnish Industry. For example, as shown by arrows on Figure 31, 30% of the plants in the industry employ less than 8 people, 30% of the industry employees work in plants that have a plant employee size of less than 50, and this plant size accounts for 78% of the industry plants. // Page 196: 66,100 total employees.			
<b>EVALUATION</b>				
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	Low	The report 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	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	Restek Corp, (2019). 33227/EPA Method 8061A Phthalate Esters Mixture.			
<b>HERO ID:</b>	6302566			
<b>Conditions of Use:</b>	Laboratory Chemical			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Physical form:	Liquid			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2023, which is less than 10 years old.
	Metric 5:	Sample Size	N/A	N/A - physical form.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides physical form and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - physical form.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	RFCI, (2020). Comments of the Resilient Floor Covering Institute (RFCI) on the Safer Products for Washington Priority Consumer Products draft report to Legislature.			
<b>HERO ID:</b>	10472417			
<b>Conditions of Use:</b>	Floor Coverings			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	Inhalation, Dermal, Ingestion			
Exposure duration:	Lifespan of vinyl flooring is provided as 30-50 years but exposure duration is not specified.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	The assessment or report uses high quality data and/or techniques or sound methods that are not from a frequently used source and associated information does not indicate flaws or quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.	
	Metric 3: Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation but information is not chemical specific.	
	Metric 4: Temporal Representativeness	High	The report is generally no more than 10 years old.	
	Metric 5: Sample Size	N/A	No sample data.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	No scope to address variability and uncertainty.	
Overall Quality Determination		High		

<b>Study Citation:</b>	Scott, R. C., Dugard, P. H., Ramsey, J. D., Rhodes, C. (1987). In vitro absorption of some o-phthalate diesters through human and rat skin. Environmental Health Perspectives 74(0):223-227.			
<b>HERO ID:</b>	674473			
<b>Conditions of Use:</b>	Dermal exposure scenarios (Applies to multiple COUs)			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	Neat chemical > 99% purity			
Exposure route:	Dermal			
Physical form:	Liquid			
Dermal exposure data:	Dermal exposure data			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	The assessment or report uses high quality data and/or techniques or sound methods that are not from a frequently used source and associated information does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S.
	Metric 3:	Applicability	Medium	The report is for dermal absorption of DBP. DIBP and DBP are isomers with similar p-chem properties, and therefore, dermal absorption of DBP is expected to be similar to dermal absorption of DIBP.
	Metric 4:	Temporal Representativeness	Low	The report is over 20 years old, however, the methods used indicate that the results of dermal absorption of the chemicals analyzed are expected to be currently valid.
	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	Assessment addresses variability among samples for the neat material, but does not address factors of uncertainty that may affect dermal absorption such as concentration, physical form, and vehicles of absorption.
Overall Quality Determination		Medium		



<b>Study Citation:</b>	Sigma-Aldrich, (2020). Diisobutyl phthalate safety data sheet.			
<b>HERO ID:</b>	6302634			
<b>Conditions of Use:</b>	Laboratory Chemicals			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Physical form:	Liquid			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2020, which is less than 10 years old.
	Metric 5:	Sample Size	N/A	N/A - physical form.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides physical form and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - physical form.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	U.S. BLS, (2023). U.S. Census Bureau of Labor Statistics Data from 2021.			
<b>HERO ID:</b>	11138808			
<b>Conditions of Use:</b>	All			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Number of sites:	Used to develop a method to estimate number of sites and workers.			
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 ( <a href="https://www.bls.gov/oes/current/oes_research_estimates.htm">https://www.bls.gov/oes/current/oes_research_estimates.htm</a> ).
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	

<b>Study Citation:</b>	U.S. Consumer Product Safety Commission (CPSC) (2011). Toxicity review of diisobutyl phthalate (DiBP, CASRN 84-69-5).			
<b>HERO ID:</b>	5155528			
<b>Conditions of Use:</b>	Manufacturing; processing			
EXTRACTION				
Parameter	Data			
Exposure route:	Occupational exposure may occur through inhalation and dermal contact where DiBP is produced or used			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Limited data are for general occupational exposure, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Medium	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	N/A	N/A-extracted data not applicable	
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		

<b>Study Citation:</b>	U.S. EPA, (2002). Flexographic ink options: A cleaner technologies substitutes assessment. Volume 1.		
<b>HERO ID:</b>	10293388		
<b>Conditions of Use:</b>	Industrial and commercial use in Ink, toner and colorant products		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Worker activity description:	Transferring and mixing inks from 55-gallon drums to 5-gallon cans in the ink preparation room and handling ink cans and press operation in the press room during a print run		
Exposure route:	inhalation and dermal exposure		
Area sampling data:	source presents an excerpt from modeled inhalation exposure on pdf page 154. HERO source does not include Appendix 3-F where full data is included.		
Dermal exposure data:	Dermal exposure data		
Exposure duration:	Transferring and mixing inks : 48 minutes per formulation per shiftOperating press: 7.5 hour shiftAdjusting inks in the 5-gallon cans in press room: 1-2.5 hours		
Exposure frequency:	250 days/year		
Number of workers:	9 workers exposed per shift (1 worker transferring and mixing inks, 8 workers during printing process), 3 shifts per day. 27 total workers exposed per day		
Personal protective equipment:	eye, face and hand protection as well as goggles, aprons, or other impervious clothing and gloves. In loud facilities, hearing protection may also be recommended		
Engineering control:	equipment guards		
<b>EVALUATION</b>			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3: Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation but data is not chemical-specific.
	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	High	Uncertainty is addressed by discussing assumptions. Variability addressed by providing low-end and high-end data
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	U.S. EPA, (2020). 2020 CDR: Commercial and consumer use.			
<b>HERO ID:</b>	10366189			
<b>Conditions of Use:</b>	Manufacture and Import			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
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.	
	Metric 4: Temporal Representativeness	High	EPA used data from the 2020 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		

<b>Study Citation:</b>	U.S. EPA, (2013). Updating CEB’s method for screening-level estimates of dermal exposure.			
<b>HERO ID:</b>	11224653			
<b>Conditions of Use:</b>	All			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Dermal exposure data:	Dermal exposure data			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Document published by EPA CEB.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are applicable to all COUs involving dermal contact.
	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 - Document describes general dermal exposure parameters. Sample size is not applicable.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by describing dermal exposure parameters for different exposure scenarios but uncertainty is not addressed.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	U.S. EPA, (2012). Phthalates action plan.		
<b>HERO ID:</b>	4565597		
<b>Conditions of Use:</b>	General industrial manufacturing, processing, or use		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Exposure route:	Available information indicates that workers may be exposed to phthalates by inhalation and dermal routes, with the dermal route seeming to be more prevalent.		
Physical form:	oily liquids		
Number of workers:	According to the IUR data, industrial workers exposed to these phthalates number in the thousands.		
Comments:	The most studied population and route of exposure for this class of chemicals has been direct exposure via ingestion by small children and infants from the mouthing of toys, teethers, or other children’s products made of flexible PVC (Babich, 2004; EU 2003 a,b; 2003-04; 2008 a,b; CPSC 2001, 2002). Exposures have also been shown to occur via prenatal exposures. (Adibi et al., 2004). Page 6		
<b>EVALUATION</b>			
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	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	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.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	U.S. EPA, (2016). Chemical Data Reporting (CDR): Complete 2016 submissions.			
<b>HERO ID:</b>	7315471			
<b>Conditions of Use:</b>	Manufacture and Import			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Physical form:	Provides physical form.			
Number of workers:	Provides an estimate of number of workers.			
<b>EVALUATION</b>				
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.	
	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.	
<b>Overall Quality Determination</b>		<b>High</b>		



<b>Study Citation:</b>	Wang, L., Gong, M., Xu, Y., Zhang, Y. (2017). Phthalates in dust collected from various indoor environments in Beijing, China and resulting non-dietary human exposure. Building and Environment 124(Elsevier):315-322.			
<b>HERO ID:</b>	4176702			
<b>Conditions of Use:</b>	commercial use			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Exposure route:	inhalation, ingestion			
Physical form:	dust			
Area sampling data:	DIBP (ug/g) in home environments were mostly not detected but ranged from ND-896. In office space median was 58.1 and ranged from ND-321. Kindergarten sampled had a median of 94.8 with a range from 15 - 2830. Public spaces had a median of 272 with a range from 31-403. Several other studies are referenced in Table 4 and their comparison with DIBP concentration of dust in relevant studies but does not state the location of these samples.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	The report uses high quality data that are not from frequently used sources and does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data is from China, a non-OECD country.
	Metric 3:	Applicability	Uninformative	Data is for at home dust ingestion which is not in-scope
	Metric 4:	Temporal Representativeness	High	Data was collected in 2010-2011 so just under 10 years old.
	Metric 5:	Sample Size	Medium	Distribution is characterized by a range of uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Variability addressed by referencing data from multiple sources across different countries. Uncertainty analysis conducted as well.
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		

<b>Study Citation:</b>	Wang, Y., Zhu, H., Kannan, K. (2019). A review of biomonitoring of phthalate exposures. Toxics 7(2):21.			
<b>HERO ID:</b>	5547263			
<b>Conditions of Use:</b>	Use of plastics			
<b>EXTRACTION</b>				
<b>Parameter</b>		<b>Data</b>		
Exposure route:		Human exposure to phthalates arises mainly from ingestion, inhalation, and dermal absorption [17,18].		
Dermal exposure data:		Dermal exposure data		
<b>EVALUATION</b>				
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	Low	The report is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, such as a consumer DIY scenario that is similar to a worker scenario.
		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	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 report addresses variability and uncertainty in the results. Uncertainty is well characterized.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Bononi, M., Tateo, F. (2009). Identification of diisobutyl phthalate (DIBP) suspected as possible contaminant in recycled cellulose for take-away pizza boxes. Packaging Technology and Science 22(1):53-58.			
<b>HERO ID:</b>	1312130			
<b>Conditions of Use:</b>	Food contact materials			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	Experimentally measured the headspace in a pizza box containing DIBP			
Release quantity:	EI (ug)=6-72 (Exposure Index)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Release methodology is known.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	The data are from an OECD country other than the U.S., Italy.
	Metric 3:	Applicability	Uninformative	The release data is for a non-occupational scenario that is out of scope, non-TSCA (FDA-regulated).
	Metric 4:	Temporal Representativeness	Medium	More than 10 years but less than 20 years old.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release data include most critical metadata but lacks additional metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	The release data study provides discussion of the variability in thedeterminants of re-lease. The release data study provides only limited discussion of the uncertainty in the release results.
Overall Quality Determination		Uninformative		

**Study Citation:** Cadogan, D., Howick, C. (2000). Plasticizers.  
**HERO ID:** 6311430  
**Conditions of Use:** Disposal

**EXTRACTION**

Parameter	Data
Description of release source:	See section 7.1.5: 250 t/yr plasticizer could be emitted to the environment from landfills in Western Europe.
Release quantity:	Per Table 5: 250 t/y.
Waste treatment methods and pollution control:	nan

**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. (Europe).
	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. 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	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	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****Low**

<b>Study Citation:</b>	Cadogan, D., Howick, C. (2000). Plasticizers.		
<b>HERO ID:</b>	6311430		
<b>Conditions of Use:</b>	Use of plastics		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Description of release source:	When plasticized PVC comes into contact with other materials, plasticizer may migrate from the plasticized PVC into the other material. The rate of migration depends not only on the plasticizer employed but also on the nature of the contact material. Plasticizer can also be extracted from PVC by a range of solvents including water. The aggressiveness of a particular solvent depends on its molecular size and its compatibility with both the plasticizer and PVC. Water extracts plasticizer very slowly, oils are slightly more aggressive, and low molecular weight solvents are the most aggressive. (p. 14). // Section 7.1.3: Some products, particularly flooring, may lose plasticizer not only by evaporation but also through extraction by soapy water during cleaning. It is possible to estimate the quantity of plasticizer extracted but many assumptions have to be made including the frequency, duration, and temperature of washing and the proportion of floors cleaned in this way. Wastewater associated with the cleaning process typically goes to the municipal sewage system. Thus, the phthalates are biodegraded and do not end up in the environment.		
Release quantity:	Per Table 5: 640 t/y for interior use (flooring, wall coverings, other film/sheet/coating, wire, cable, profiles, hose); 5600 t/y from exterior use.		
Release or emission factors:	Release or emission factors		
<b>EVALUATION</b>			
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. (Europe).
	Metric 3: Applicability	Low	The release data are for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, such as a consumer DIY scenario that is similar to a worker scenario.
	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	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	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.
<b>Overall Quality Determination</b>		<b>Low</b>	

<b>Study Citation:</b>	Cadogan, D., Howick, C. (2000). Plasticizers.			
<b>HERO ID:</b>	6311430			
<b>Conditions of Use:</b>	Plasticizer Production and Distribution			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	See section 7.1.1: Phthalate plasticizers are produced by esterification of phthalic anhydride in closed systems hence losses to atmosphere are minimal.			
Release quantity:	Per Table 5: 220 t/y. Inquiries of all the principal plasticizer producers indicate a maximum total emission in Western Europe of 220 t/yr, 90% of which is to the water compartment. It is estimated that, as a result of cleaning and spillages, the maximum emission to the environment is 80 t/yr. (section 7.1.1)			
<b>EVALUATION</b>				
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. (Europe).
	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. 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	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	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.
<b>Overall Quality Determination</b>			<b>Low</b>	

**Study Citation:** Cadogan, D., Howick, C. (2000). Plasticizers.  
**HERO ID:** 6311430  
**Conditions of Use:** Use as a plasticizer

**EXTRACTION**

Parameter	Data
Description of release source:	See section 7.1.2: During the production of flexible PVC products plasticizers are exposed for up to several minutes to temperatures of ~180°C. The exact conditions depend on the processing technique employed, but it is evident that the loss of plasticizer by evaporation and degradation can be significant. Of the various processing techniques used, injection molding and extrusion involve little or no exposure of hot product to the surrounding air, hence they give rise to no significant emission of plasticizer to the atmosphere. This is not the case in the production of sheet and film by calendaring or spread coating.
Release quantity:	Per Table 5: Emissions during processing totals 950 t/y, with the following breakdown for production of plastic products: 280 t/y from calendered film and sheet, 10 t/y from calendered flooring, 520 t/y for spread coating, 50 t/y for other plastisol, and 90 t/y for extrusion/injection molding.
Waste treatment methods and pollution control:	nan

**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. (Europe).
	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. 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	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	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****Low**

<b>Study Citation:</b>	CEPE, (2020). SpERC fact sheet: Industrial application of coatings by spraying.
<b>HERO ID:</b>	10442901
<b>Conditions of Use:</b>	Paints and Coatings

**EXTRACTION**

Parameter	Data
Description of release source:	Industrial application of coatings by spraying
Release or emission factors:	Release or emission factors
Release frequency:	225 days/year
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**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 release data are for an occupational scenario that is similar to an occupational scenario 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	N/A	No sample data.
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**



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

**EXTRACTION**

Parameter	Data
Description of release source:	Professional application of coatings and inks by spraying
Release or emission factors:	Release or emission factors
Release frequency:	Indoor: 365 days/yrOutdoor: 225 days/yr
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**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 release data are for an occupational scenario that is similar to an occupational scenario 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	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	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**

<b>Study Citation:</b>	DOE., WA (2020). Priority consumer products report to the Legislature: Safer products for Washington implementation phase 2.			
<b>HERO ID:</b>	10454465			
<b>Conditions of Use:</b>	Floor Covering			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	Phthalate air and dust emissions from vinyl flooring.			
Release quantity:	0.17 metric tons (374 pounds) of phthalates are released to the environment from vinyl flooring. (in Washington state) (pg. 93/199)			
<b>EVALUATION</b>				
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.
	Metric 3:	Applicability	Low	The release data are for an occupational scenario within the scope of the risk evaluation but the release data is for Washington state only.
	Metric 4:	Temporal Representativeness	Medium	Release estimated from data that is 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	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.
<b>Overall Quality Determination</b>			<b>Low</b>	

**Study Citation:** ECCC/HC, (2020). Science assessment of plastic pollution.  
**HERO ID:** 7330238  
**Conditions of Use:** disposal

**EXTRACTION**

Parameter	Data
Description of release source:	Road traffic-related releases of particles from tire wear and tear are a source of microplastics to outdoor air. Additional sources of microplastics in outdoor air are thought to include airplane tires, artificial turf, thermoplastic road markings, waste incineration, construction, landfills, industrial emissions, and tumble dryer exhaust. Deposition and dispersion of all airborne plastic particles from the air may result in accumulations of microplastics in water. The primary source of microplastic particles in indoor air is thought to be the shedding of polymeric textile fibers from clothing, furniture, carpeting, and household goods due to wear and tear or abrasion.
Release quantity:	Of the 4 667 kt of plastics that entered the Canadian market in 2016, an estimated 3 268 kt were discarded as waste. Of that plastic waste, an estimated 29 kt (or 1%) were discarded outside of the normal waste stream (i.e., not landfilled, recycled or incinerated) in 2016, through direct release to the environment or through dumps or leaks. An estimated 9% of the remaining plastic waste was recycled, 86% was landfilled, and 4% was incinerated for energy recovery. In a global context, it is estimated that only 30% (2,500,000 kt) of all plastics ever produced are still in use. This means that 6,300,000 kt of global cumulative plastic waste was created between 1950 and 2015. If plastic manufacturing continues at its current pace, the accumulation of plastics will continue to accelerate. It is estimated that by 2050, 12,000,000 kt of plastic waste will have been discarded globally to landfills or the environment.
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**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	The data are from an OECD country other than the U.S.
	Metric 3: Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	the data are generally no more than 10 years old.
	Metric 5: Sample Size	Low	Distribution of samples is qualitative
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**

<b>Study Citation:</b>	ERG, (1998). Air emissions inventories, volume 2: Point sources: Chapter 11: Preferred and alternative methods for estimating air emissions from plastic products manufacturing.
<b>HERO ID:</b>	7349020
<b>Conditions of Use:</b>	Plastics Product Manufacturing

**EXTRACTION**

Parameter	Data
Description of release source:	The primary sources of emissions at plastic products manufacturing facilities are the pieces of equipment (e.g., extruder hopper, die head, sander) used to handle raw materials and produce the final product. These are typically the locations where chemical reactions occur, liquid solvents and solvent blends are exposed to the atmosphere, solid resin is heated and melted, and additives are introduced. In addition to emissions generated directly from primary production processes associated with plastic products manufacturing, there may be additional emissions produced by secondary processes at these facilities. Emission sources from these secondary processes include storage tanks, equipment leaks, wastewater treatment, combustion sources, and cleaning and surface coating operations. Emissions from plastic products manufacturing may be generally classified as follows: Volatile organic compound (VOC) and hazardous air pollutant (HAP) emissions resulting from the volatilization of free monomer or solvent in the primary polymer blend during processing; & VOC and HAP emissions that result from secondary process materials, such as blowing agents, additives, and lubricants (mold release compounds); & VOC, HAP, and particulate matter (PM) emissions that result from byproducts formed by chemical reactions or formed during heating of resins; and & PM emissions generated during raw material handling and finishing operations. (Section 2.2). Additional description of specific pollutants (e.g., solvents, particulates) provided.
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**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	The release data are for an occupational scenario within the scope of the risk evaluation; however, the data are general and not chemical specific.
	Metric 4: Temporal Representativeness	Low	The report is from 1998, which is more than 20 years old.
	Metric 5: Sample Size	Medium	The emission factor is provided as a single data point with unclear statistical representativeness.
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	High	The release data study addresses variability in the determinants of release. The release data study addresses uncertainty in the release results.

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<b>Study Citation:</b> ERG, (1998). Air emissions inventories, volume 2: Point sources: Chapter 11: Preferred and alternative methods for estimating air emissions from plastic products manufacturing.			
<b>HERO ID:</b> 7349020			
<b>Conditions of Use:</b> Plastics Product Manufacturing			
Domain	Metric	EVALUATION Rating	Comments
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	Grace, (2022). Di-isobutyl phthalate (DIBP) use (sanitized).			
<b>HERO ID:</b>	11589992			
<b>Conditions of Use:</b>	Incorporation into formulation, mixture, or reaction product			
EXTRACTION				
Parameter	Data			
Description of release source:	PDF Pg. 3”DIBP enters the site waste stream from two sources. The first source is the rinsate from drum cleaning as described above. The waste stream post formulation of the pre-catalyst mixture is the second source of DIBP in the stream (Step H).”			
Release quantity:	PDF Pg. 3”Approximately, a total of 190 MT of DIBP is processed through waste streams at Grace Sites in the US annually.”			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Low	Methodology is not specified.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for incorporation into formulation, mixture, or reaction product, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Data are no more than 10 years old.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	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		

<b>Study Citation:</b>	Gu, Z., Feng, J., Han, W., Wu, M., Fu, J., Sheng, G. (2010). Characteristics of organic matter in PM2.5 from an e-waste dismantling area in Taizhou, China. Chemosphere 80(7):800-806.			
<b>HERO ID:</b>	1256038			
<b>Conditions of Use:</b>	Disposal			
EXTRACTION				
Parameter		Data		
Description of release source:		Electrical/electronic waste from electromotors, transformers, computers, printers, copying machines, television sets, and mobile phones.		
Release or emission factors:		Release or emission factors		
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	Low	Data are from China, a non-OECD country.
	Metric 3:	Applicability	High	Data are for the disposal of phthalate-containing wastes, an in-scope occupational sce- nario.
	Metric 4:	Temporal Representativeness	Medium	Data are greater than 10 years old but no more than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (means, standard deviations) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Most critical metadata included.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability is addressed by sampling during the summer and winter. Uncertainty isn't addressed.
Overall Quality Determination			Medium	

<b>Study Citation:</b>	Jo, S. H., Lee, M. H., Kim, K. H., Kumar, P. (2018). Characterization and flux assessment of airborne phthalates released from polyvinyl chloride consumer goods. Environmental Research 165:81-90.			
<b>HERO ID:</b>	4683362			
<b>Conditions of Use:</b>	Consumer use of plastics			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	Emissions from consumer plastics in an emission chamber			
Release or emission factors:	Release or emission factors			
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	Low	The data are from a non-OECD country, and locality-specific factors may impact (e.g., potentially greater differences in regulatory emission limits, industry/ process technologies) releases relative to the U.S., or the country of origin is not specified.
	Metric 3:	Applicability	Low	The release data are for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, such as a consumer DIY scenario that is similar to a worker scenario.
	Metric 4:	Temporal Representativeness	High	The operations, equipment, and worker activities associated with the data indicate that the data should to be representative of current operations, equipment, and activities. The release data were collected after the most recent federal regulatory action (e.g., NE-SHAP for air release or effluent limit guideline (ELG) for water release) or update or are no more than 10 years old, whichever is shorter. If no federal regulation is established, the data are generally no more than 10 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	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	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		Medium		



<b>Study Citation:</b>	Kruopiene, J., Dvarioniene, J., Dudutyte, Z., Stance, L., Buzelyte, J. (2014). The use of hazardous chemical substances in Lithuanian industry: how sound is it?. Journal of Cleaner Production 72:89-95.			
<b>HERO ID:</b>	5631621			
<b>Conditions of Use:</b>	Processing, commercial, consumer			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	Detected release sources for DIBP were: paint production, shipyards, car washing, leakage from landfills, and supermarkets.			
Release quantity:	DIBP for car washing effluents: 68 ug/L			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Source is peer reviewed so methodology likely to contain little to no errors.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data is for Lithuania, an OECD country
	Metric 3:	Applicability	Medium	Data contains condition of use information for DIBP but does not contain much quantifiable data for DIBP for in-scope uses.
	Metric 4:	Temporal Representativeness	High	Data is less than 10 years old.
	Metric 5:	Sample Size	Low	Characterized by no statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Includes release media
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability across different industries. Does not address uncertainty.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Lee, Y. S., Lee, S., Lim, J. E., Moon, H. B. (2019). Occurrence and emission of phthalates and non-phthalate plasticizers in sludge from wastewater treatment plants in Korea. Science of the Total Environment 692:354-360.
<b>HERO ID:</b>	6959335
<b>Conditions of Use:</b>	Disposal

**EXTRACTION**

Parameter	Data
Description of release source:	Sludge from wastewater treatment plants in Korea
Release quantity:	DIBP sludge and effluent emissions: Domestic WWTPs: 27.91 kg/day/WWTP Mixed WWTPs: 36.2 kg/day/WWTP Industrial WWTPs: 29.4 kg/day/WWTP
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**EVALUATION**

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Korea, an OECD country.
	Metric 3: Applicability	High	Data are for the disposal of phthalate-containing wastes, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Data are no more than 10 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (ranges, means, number of samples) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Most critical metadata included.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	Uncertainty is addressed in the sampling method and detection ranges. Variability is addressed by sampling at residential and industrial WWTPs.

**Overall Quality Determination****High**

<b>Study Citation:</b>	Liang, Y., Xu, Y. (2014). Emission of phthalates and phthalate alternatives from vinyl flooring and crib mattress covers: The influence of temperature. Environmental Science & Technology 48(24):14228-14237.			
<b>HERO ID:</b>	3015875			
<b>Conditions of Use:</b>	Floor coverings			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Release quantity:	Total airborne (μg/m3) for DnBP at 25 °C: 1.70Total airborne (μg/m3) for DnBP at 36 °C: 29.9Table 1 and Figure 1 also shows that the gas-phase concentration of DBP increases with increasing temperature. The gas phase concentration increases from 27.1 (μg/m3) to 4146 (μg/m3) from 25 °C to 55 °C.			
Comments:	The emission values extracted is for DnBP, which may be similar to DiBP.			
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	Low	Emissions in residential homes are not in scope for the risk evaluation. But, the gas phase concentrations of DBP at different temperatures may be used as surrogate data to calculate emissions for the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Report is from 2014.
	Metric 5:	Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics. It is unclear if analysis is representative.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release data include most critical metadata, including release media, but lacks additional metadata, such as release frequency.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability is addressed by including emission rates at different temperatures. Uncertainty is not addressed.
Overall Quality Determination			Medium	

<b>Study Citation:</b>	Markiewicz, A., Björklund, K., Eriksson, E., Kalmykova, Y., Strömvall, A. M., Siopi, A. (2017). Emissions of organic pollutants from traffic and roads: Priority pollutants selection and substance flow analysis. Science of the Total Environment 580:1162-1174.			
<b>HERO ID:</b>	3867109			
<b>Conditions of Use:</b>	Emissions from vehicles and traffic-related activities			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	Tires, brake linings, integrated vehicle components, car care products, fuels, oils, and lubricants, asphalt, and road paint			
Release quantity:	Approximately 4.1 kg of four selected phthalates were emitted annually in the Garda catchment area.			
Release or emission factors:	Release or emission factors			
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	Medium	Report is from Sweden, an OECD country.
	Metric 3:	Applicability	Low	Data are for consumer use of automotive care products, paints and coatings, and plastic and rubber products, which can be compared to the commercial uses of these applications, which are in-scope
	Metric 4:	Temporal Representativeness	High	Data are no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (means) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Most critical metadata included.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty is addressed for the release estimation process. Variability is not addressed.
Overall Quality Determination			Medium	

<b>Study Citation:</b>	Mersiowsky, N. (2002). Long-term fate of PVC products and their additives in landfills. Progress in Polymer Science 27(10):2227-2277.
<b>HERO ID:</b>	6826007
<b>Conditions of Use:</b>	Disposal

**EXTRACTION**

Parameter	Data
Description of release source:	Phthalates leach from consumer PVC products in landfills
Release quantity:	In Western Europe, 1,874,000 tons/year of PVC waste are disposed of. 29 kttons/year of phthalates are disposed of from cables, and 116 kton/year of phthalates are disposed of from floorings.
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**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	Medium	Data are from Germany, an OECD country.
	Metric 3: Applicability	High	Data are for the disposal of phthalate wastes, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Medium	Data are greater than 10 years old but no more than 20 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (medians, minimums and maximums, percentages) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Most critical metadata included.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty is addressed in the life cycle assessment methods. Variability is not addressed.

**Overall Quality Determination****High**

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	11360398			
<b>Conditions of Use:</b>	Disposal			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Release quantity:	PDF PG. 4 "We estimate approximately 44 million tons (Mt) of plastic waste was managed through landfilling, combustion, and recycling in 2019."			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
<b>EVALUATION</b>				
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	Medium	Data are for disposal, an in-scope occupational scenario; however, the data are not chemical specific.
	Metric 4:	Temporal Representativeness	High	Data are no more than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Release media provided but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by discussing multiple plastic waste types, but uncertainty is not addressed.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	OECD, (2011). Resource compendium of PRTR release estimation techniques, part 4: Summary of techniques for releases from products, version 1.0.			
<b>HERO ID:</b>	7348917			
<b>Conditions of Use:</b>	Commercial & Consumer Use			
EXTRACTION				
Parameter	Data			
Description of release source:	Building and construction products, Electrical and electronic products, Furniture, Nanoproducts, Packages and plastic bags, personal care and cleaning products, Textile and leather products, Toys and low-cost jewelry (page 17/109). Releases typically occur during the first use of a product, when carrying out maintenance of the product, and due to wearing, exposure to heat or light or other ageing of the product (page 63/109).			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Medium	OECD paper provides general methods and equations used to calculate emissions, but details aren’t provided.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are provided by the OECD.	
	Metric 3: Applicability	Medium	Data are for various consumer and commercial uses which are in scope of the risk evaluation but not chemical-specific (emission factor is for DEHP).	
	Metric 4: Temporal Representativeness	Low	Paper was published in 2011, but emission factor data is from 2002, which is greater than 20 years old.	
	Metric 5: Sample Size	Low	Emission factor data is characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Release data include release source and emission factors. Formulas for release quantity are provided. Data lacks release frequency and waste treatment methods.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The release data study does not address variability or uncertainty.	
Overall Quality Determination		Low		

**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:** Formulation of paint and varnish

**EXTRACTION**

Parameter	Data
Description of release source:	Air pollutant emissions are primarily the fugitive type and consist of evaporation losses of the volatile portion of the vehicle from the milling operation and from various product holding tanks and packing stations. There are also some fugitive particulate emissions that result from handling and emptying of pigment or extender bags into the grinding and dispersion mills. In some plants these loading areas are hooded and bags and pigment dusts are passed to a central collection station. At this station bags are removed for refuse disposal and the pigment dust is collected in a fabric filter and recycled into primer or other dark paint mixes. // Waste materials constitute a major source of potential liquid pollutants. These include spoiled batches, residues and solvent and aqueous solutions for washing equipment. // Most solid waste, with the exception of that which can be considered part of an air pollution emission, is incorporated into the liquid wastes described in the previous section. These include pigment particulate and latex emulsion as well as the non-volatile portion of the film former which would be left if the paint or resin were allowed to dry.
Release quantity:	Source contains information on hydrocarbon, organics, and particulate emissions, and waste solvent, resin, and paint, but nothing specific to this chemical.
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**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. 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	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	High	The release data study addresses variability in the determinants of release. The release data study addresses uncertainty in the release results.

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<b>Study Citation:</b>		programs, E.O. (1974). Air pollution control engineering and cost study of the paint and varnish industry.		
<b>HERO ID:</b>		6580284		
<b>Conditions of Use:</b>		Formulation of paint and varnish		
Domain	Metric	EVALUATION		Comments
		Rating		
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	Radian Corp, (1989). Environmental analysis for the Shell Martinez RM-17 incinerator, with cover letter dated 3/15/1991 (sanitized).
<b>HERO ID:</b>	1335691
<b>Conditions of Use:</b>	Disposal - incineration

**EXTRACTION**

Parameter	Data
Description of release source:	The Shell incinerator contains a single combustion chamber with waste injection nozzles located at the base. The unit operates with a firebox temperature ranging between 1400 to 1800 F. Various air pollution control equipment exist in the process. Combustion gases exit the incinerator system through a 100-foot stack. Figure 2-1 in the source illustrates the combustion process. Two liquid waste feed streams and process offgases, generated in the production of RM-17, are injected into the incinerator as a primary means of waste treatment. Only waste streams generated from the production of RM-17 at the Shell Manufacturing Complex are combusted in the incinerator. The health risk calculations presented in this document assume a constant feed rate of one gallon per minute, or 525,600 gallons per year. This feed rate is approximately 150 times greater than the historical feed rate for the incinerator. The one gallon per minute feed rate was chosen to provide, a health conservative analysis.
Release quantity:	emission estimates for the RM-17 incinerator: $1.4 \times 10^{-4}$ g/sec (this data is from published research data on waste incinerators not from this report).
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**EVALUATION**

Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Release data methodology and sources of information are mostly EPA sources so likely accurate.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is for US
	Metric 3:	Applicability	Medium	Data is for company waste incinerator which is in-scope, but the source does not contain any info for DIBP.
	Metric 4:	Temporal Representativeness	Low	Data is greater than 20 years old.
	Metric 5:	Sample Size	Low	Not characterized by statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Release include release media, process, unit operation and activity that is the source of the release.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Does not address variability. Uncertainty analysis conducted in calculations

**Overall Quality Determination****Medium**

<b>Study Citation:</b>	RFCI, (2020). Comments of the Resilient Floor Covering Institute (RFCI) on the Safer Products for Washington Priority Consumer Products draft report to Legislature.
<b>HERO ID:</b>	10472417
<b>Conditions of Use:</b>	Floor Coverings

## EXTRACTION

Parameter	Data
Description of release source:	Waste from disposal of vinyl flooring
Release or emission factors:	nan
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

## 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 report is for an occupational scenario within the scope of the risk evaluation but information is not chemical specific.
	Metric 4: Temporal Representativeness	High	Report is less than 10 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	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

<b>Study Citation:</b>	Saeed, T., Al-Jandal, N., Abusam, A., Taqi, H., Al-Khabbaz, A., Zafar, J. (2017). Sources and levels of endocrine disrupting compounds (EDCs) in Kuwait's coastal areas. Marine Pollution Bulletin 118(1-2):407-412.
<b>HERO ID:</b>	3859095
<b>Conditions of Use:</b>	Disposal: Wastewater treatment plant (POTW)

**EXTRACTION**

Parameter	Data
Description of release source:	Use of products such as cosmetics, perfumes, detergents, aerosol sprays, and plastics
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**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	Low	The data are from a non-OECD country, and locality-specific factors may impact (e.g., potentially greater differences in regulatory emission limits, industry/ process technologies) releases relative to the U.S., or the country of origin is not specified.
	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 operations, equipment, and worker activities associated with the data indicate that the data should to be representative of current operations, equipment, and activities. The release data were collected after the most recent federal regulatory action (e.g., NE-SHAP for air release or effluent limit guideline (ELG) for water release) or update or are no more than 10 years old, whichever is shorter. If no federal regulation is established, the data are generally no more than 10 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	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**

<b>Study Citation:</b>	Schripp, T., Wensing, M. (2009). Emission of VOCs and SVOCs from electronic devices and office equipment. :405-430.			
<b>HERO ID:</b>	9493521			
<b>Conditions of Use:</b>	Inks, Toner, and Colorant Products			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	Heat being generated inside the device, which can in turn result in the generation of higher levels of emissions. (1/26) Other phthalates have been detected in emissions from paper, television sets, monitors, VCRs and printers. Inks, Toner, and Colorant Products used within printers(12/26)			
Release or emission factors:	Release or emission factors			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	The release data methodology is known or expected to be accurate but may not cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Germany, an OECD country.
	Metric 3:	Applicability	Medium	Data are for commercial use of Inks, Toner, and ColorantProducts, an in-scope occupational scenario, but are not chemical specific.
	Metric 4:	Temporal Representativeness	Medium	Data are greater than 10 years old but no more than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Release media and emissions factors provided but missing release quantity, and frequency.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
<b>Overall Quality Determination</b>			<b>Medium</b>	

**Study Citation:** U.S. EPA, (2002). Flexographic ink options: A cleaner technologies substitutes assessment. Volume 1.  
**HERO ID:** 10293388  
**Conditions of Use:** Industrial and commercial use in Ink, toner and colorant products

**EXTRACTION**

Parameter	Data
Description of release source:	Source estimates air releases from fugitive releases from ink chamber and the press process as well as stack releases from the oxidizer after the press process (pdf page 146)
Release quantity:	Calculated air release estimates provided for multiple types of inks (i.e. water-based, solvent-based, and UV-cured) on pdf page 148 and more in appendix 3-D (not included in the HERO file)
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**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	Data are for use in ink during printing, an in-scope occupational scenario. However, data is general and not specific to this chemical.
	Metric 4: Temporal Representativeness	Medium	Report is between 10 and 20 years old.
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Release data include 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	High	Uncertainty is addressed by discussing assumptions. Variability addressed by providing calculated data for a range of scenarios.

**Overall Quality Determination****Medium**

<b>Study Citation:</b>	U.S. EPA, (2023). Methodology for estimating environmental releases from sampling waste (revised draft).			
<b>HERO ID:</b>	11373484			
<b>Conditions of Use:</b>	Multiple OES			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	Releases from sampling waste.			
Release quantity:	Document plots 60 data points of daily chemical use rate vs. loss fraction on PDF Pg. 7 and provides sample calculations for calculating daily releases on PDF Pg. 13-16			
Release or emission factors:	Release or emission factors			
Release frequency:	Document provides methodology for estimating release frequency on PDF Pg. 10.			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Methodology is known and expected to be accurate and cover all release sources at the site.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for multiple in-scope, occupational scenarios.
	Metric 4:	Temporal Representativeness	High	Data are no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (50th and 95th percentile) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All metadata provided.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by loss fractions for multiple chemical throughput ranges, but uncertainty is not addressed.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	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.
<b>HERO ID:</b>	7310513
<b>Conditions of Use:</b>	Paint and varnish manufacturing

**EXTRACTION**

Parameter	Data
Description of release source:	See page 29. The primary factors affecting emissions from paint manufacture are care in handling dry pigments, types of solvents used, and mixing temperature. About 1 or 2 percent of the solvent is lost even under well-controlled conditions. Particulate emissions amount to 0.5 to 1.0 percent of the pigment handled. Varnish cooking emissions <sup>7</sup> largely in the form of volatile organic compounds, depend on the cooking temperatures and times, the solvent used, the degree of tank enclosure and the type of air pollution controls used. Emissions from varnish cooking range from 1 to 6 percent of the raw material.
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**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.
	Metric 3: Applicability	Medium	The release data are for an occupational scenario within the scope of the risk evaluation. Not specific to DIBP.
	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	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by multiple sources for emission factors, but uncertainty is not addressed.

**Overall Quality Determination****Low**



<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	7310513			
<b>Conditions of Use:</b>	plastics manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	See page 41-74. The major sources of air contamination in plastics manufacturing are the raw materials or monomers, solvents, or other volatile liquids emitted during the reaction; sublimed solids such as phthalic anhydride emitted in alkyd production; and solvents lost during storage and handling of thinned resins. Additional description provided.			
Release or emission factors:	Release or emission factors			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
<b>EVALUATION</b>				
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.
	Metric 3:	Applicability	High	The release data are for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Low	Data are greater than 20 years old.
	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	Medium	Variability addressed by multiple sources for emission factors, but uncertainty is not addressed.
<b>Overall Quality Determination</b>			<b>Low</b>	

<b>Study Citation:</b>	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.
<b>HERO ID:</b>	7310513
<b>Conditions of Use:</b>	printing ink manufacturing

**EXTRACTION**

Parameter	Data
Description of release source:	See page 74. Varnish or vehicle preparation by heating is by far the largest source of ink manufacturing emissions. Cooling the varnish components - resins, drying oils, petroleum oils, and solvents produces odorous emissions. At about 350°F (175°C) the products begin to decompose, resulting in the emission of decomposition products from the cooking vessel. Emissions continue throughout the cooking process with the maximum rate of emissions occurring just after the maximum temperature has been reached. Additional description provided.
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**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.
	Metric 3: Applicability	Medium	The release data are for an occupational scenario within the scope of the risk evaluation. Not Specific to DIBP.
	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	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty			
	Metric 7: Metadata Completeness	Medium	Variability addressed by multiple sources for emission factors, but uncertainty is not addressed.

**Overall Quality Determination****Low**

<b>Study Citation:</b>	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.
<b>HERO ID:</b>	7310513
<b>Conditions of Use:</b>	soap and detergent manufacturing

**EXTRACTION**

Parameter	Data
Description of release source:	See page 79-82. The main atmospheric pollution problem in soap manufacturing is odor. The storage and handling of liquid ingredients (including sulfonic acids and salts) and sulfates are some of the sources of this odor. Vent lines, vacuum exhausts, raw material and product storage, and waste streams are all potential odor sources. The exhaust air from detergent spray drying towers contains 2 types of air contaminants: (1) fine detergent particles and (2) organics vaporized in the higher temperature zones of the tower. Additional description provided.
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**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.
	Metric 3: Applicability	Medium	The release data are for an occupational scenario within the scope of the risk evaluation. Not specific to DIBP.
	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	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty			
	Metric 7: Metadata Completeness	Medium	Variability addressed by multiple sources for emission factors, but uncertainty is not addressed.

**Overall Quality Determination****Low**

<b>Study Citation:</b>	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.
<b>HERO ID:</b>	7310513
<b>Conditions of Use:</b>	synthetic fiber manufacturing

**EXTRACTION**

Parameter	Data
Description of release source:	See page 89-101. Air pollution emission points in the wet spinning organic solvent process are similar to those of dry spinning. Wet spinning processes that use solutions of acids or salts to dissolve the polymer chips emit no solvent VOC, only unreacted monomer, and are, therefore, relatively clean from an air pollution standpoint. For those that require solvent, emissions occur as solvent evaporates from the spinning bath and from the fiber in post-spinning operations. Additional description provided.
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**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.
	Metric 3: Applicability	Medium	The release data are for an occupational scenario within the scope of the risk evaluation. Not specific to DIBP.
	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	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty			
	Metric 7: Metadata Completeness	Medium	Variability addressed by multiple sources for emission factors, but uncertainty is not addressed.

**Overall Quality Determination****Low**

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	7310513			
<b>Conditions of Use:</b>	synthetic rubber manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	See page 107. Because recovery of the unreacted monomers and their subsequent purification are essential to economical operation, unreacted butadiene and styrene from the emulsion crumb polymerization process normally are recovered. The latex emulsion is introduced to flash tanks where, using vacuum flashing, the unreacted butadiene is removed. The butldiene is then compressed, condensed, and pumped back to the tank farm storage area for subsequent reuse. The condenser tail gases and noncondensables pass through a butadiene adsorber/desorber unit, where more butadiene is recovered. Some noncondensables and VOC vapors pass to the atmosphere or, at some plants, to a flare system. The latex stream from the butadiene recovery area is then sent to the styrene recovery process, usually taking place in perforated plate steam stripping columns. Additional description provided.			
Release or emission factors:	Release or emission factors			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
<b>EVALUATION</b>				
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.
	Metric 3:	Applicability	Medium	The release data are for an occupational scenario within the scope of the risk evaluation. Not specific to DIBP.
	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	Release data include release media but no other metadata.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by multiple sources for emission factors, but uncertainty is not addressed.
<b>Overall Quality Determination</b>			<b>Low</b>	

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

**EXTRACTION**

Parameter	Data
Description of release source:	The only pollutants emitted in significant quantities from solvent base coating using plasticizers are volatile organic compounds from solvent evaporation. In an uncontrolled facility, essentially all of the solvent used in the coating formulation is emitted to the atmosphere. Of these uncontrolled emissions, 80 to 95 percent are emitted with the drying oven exhaust. Some solvent (from zero to 5 percent) can remain in the final coated product, although this solvent will eventually evaporate into the atmosphere. The remainder of applied solvent is lost from a number of small sources as fugitive emissions. There are also VOC losses from solvent storage and handling, equipment cleaning, miscellaneous spills, and coating formulation mixing tanks. Fugitive solvent emissions during the coating process come from the evaporative loss of solvent around the coating head and from the exposed wet web prior to its entering the drying oven.
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**EVALUATION**

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	release data methodology is known or expected to be accurate
Domain 2: Representativeness	Metric 2: Geographic Scope	High	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	Low	more than 20 years old
	Metric 5: Sample Size	Medium	Distribution of samples is characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	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 no discussion of the uncertainty in the release results.

**Overall Quality Determination****Medium**

**Study Citation:** U.S. EPA, (1995). Ap-42: Chapter 4.12 - Manufacture of rubber products.  
**HERO ID:** 7315841  
**Conditions of Use:** Manufacture of Rubber Products

**EXTRACTION**

Parameter	Data
Description of release source:	Section 4.12.2: On a pound of pollutant emitted per pound of rubber mixed basis, test data indicated that emissions were not dependent on mixer size. // Section 4.12.3: The mechanically-created or externally-added heat present during the six principal processes (mixing, milling, extrusion, calendering, curing, and grinding) cause volatile organic compounds (VOC) and hazardous air pollutants (HAP) to be emitted. Particulate matter is primarily emitted from the dry chemicals utilized in mixing and as a result of grinding. // Section 3 of the Emission Factor Documentation lists specific emission points: Mixing, milling, extrusion, autoclave curing, platen press curing, hot air curing, calendering, grinding.
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	nan

**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. The operations, equipment, and worker activities are not available or indicate that the associated data are expected to be outdated.
	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	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**

**Study Citation:** U.S. EPA, (2023). AP-42: Chapter 5 - Petroleum industry.  
**HERO ID:** 9102566  
**Conditions of Use:** processing of fuels and related products

**EXTRACTION**

Parameter	Data
Description of release source:	Table 5.1-1 includes a list of emission factors. None are applicable to DIBP, but it still shows the sources of the emissions. (11/21) Other sources include unloading and transportation of marine vessels, oil tankers, and other petroleum transportation. (1/17)
Release or emission factors:	nan
Waste treatment methods and pollution control:	nan

**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	Medium	Data are for the processing of fuels and related products, but aren't chemical specific.
	Metric 4: Temporal Representativeness	Medium	The release data were collected after the most recent federal regulatory action or update but are generally, more than 10 years old. If no federal regulation is established, the data are more than 10 years but no more than 20 years old. However, operations, equipment, and worker activities are expected to be reasonably representative of current conditions.
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (emission factors) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Release media and emissions factors provided but missing release quantity and frequency.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability is addressed by describing different control methods. Uncertainty isn't addressed.

**Overall Quality Determination****Medium**



<b>Study Citation:</b>	Zhu, Q., Jia, J., Zhang, K., Zhang, H., Liao, C. (2019). Spatial distribution and mass loading of phthalate esters in wastewater treatment plants in China: An assessment of human exposure. Science of the Total Environment 656:862-869.
<b>HERO ID:</b>	5043529
<b>Conditions of Use:</b>	Disposal - wastewater treatment plant

**EXTRACTION**

Parameter	Data
Number of sites:	46
Description of release source:	Release source was from WWTPs across different Chinese provinces.
Release quantity:	DIBP (ug/g dw) in sewage sludges from WWTP - Mean: 0.440; median: 0.211; max: 5.92; min: 0.0003 (below LOQ so value is LOQ/2)
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**EVALUATION**

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Source is peer reviewed so likely to contain no errors and be accurate.
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data is from China, a non-OECD country.
	Metric 3: Applicability	Low	Release data is for municipal waste water treatment and does not apply to condition of use for DIBP.
	Metric 4: Temporal Representativeness	High	Data is less than 10 years old
	Metric 5: Sample Size	Medium	Samples characterized by a range with uncertain statistics
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Release data includes release media but not much other metadata
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Addresses variability across multiple treatment plants but not uncertainty.

**Overall Quality Determination****Medium**

<b>Study Citation:</b>	EC/HC, (2015). State of the science report: Phthalate substance grouping: Medium-chain phthalate esters: Chemical Abstracts Service Registry Numbers: 84-61-7; 84-64-0; 84-69-5; 523-31-9; 5334-09-8; 16883-83-3; 27215-22-1; 27987-25-3; 68515-40-2; 71888-89-6.		
<b>HERO ID:</b>	3688160		
<b>Conditions of Use:</b>	Production and life cycle		
EXTRACTION			
<b>Parameter</b>	<b>Data</b>		
Description of release source:	Medium-chain phthalates are expected to be released primarily to water through wastewater effluents from industrial sources and through disperse releases from consumer products. In products, medium-chain phthalates are not bound within the matrix and are therefore subject to migration and environmental release. Consumer products disposed to wastewater treatment systems are another potential source of environmental releases (p. 4).		
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	Medium	The data are from an OECD country other than the U.S. (Canada).
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 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	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

<b>Study Citation:</b>	EC/HC, (2017). Draft screening assessment: Phthalate substance grouping.			
<b>HERO ID:</b>	5353181			
<b>Conditions of Use:</b>	Waste handling, treatment and disposal			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:		Releases may occur during the manufacture and processing of phthalates, including transportation and storage, as well as during production, use and disposal of products that contain phthalates (e.g., release of phthalates into wastewater systems from use of cosmetics).(29/228)		
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Canada, an OECD country.
	Metric 3:	Applicability	High	Data are for waste handling, treatment, and disposal, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	N/A	Release source information
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	Release source information
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	ECETOC, (1985). An assessment of the occurrence and effects of dialkyl ortho-phthalates in the environment.			
<b>HERO ID:</b>	679967			
<b>Conditions of Use:</b>	Manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Release or emission factors:	Release or emission factors			
<b>EVALUATION</b>				
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	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/ process technologies) may impact exposures or releases relative to the U.S.
	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	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	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b> ECETOC, (1985). An assessment of the occurrence and effects of dialkyl ortho-phthalates in the environment.				
<b>HERO ID:</b> 679967				
<b>Conditions of Use:</b> Distribution				
<b>EXTRACTION</b>				
<b>Parameter</b>		<b>Data</b>		
Description of release source:		During distribution, losses may occur during the cleaning of drums and tanks or, exceptionally, by accidental spillage.		
Release or emission factors:		Release or emission factors		
<b>EVALUATION</b>				
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	Medium	
		Metric 3: Applicability	High	
		Metric 4: Temporal Representativeness	Low	
		Metric 5: Sample Size	Low	
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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	ECETOC, (1985). An assessment of the occurrence and effects of dialkyl ortho-phthalates in the environment.			
<b>HERO ID:</b>	679967			
<b>Conditions of Use:</b>	Manufacture of plasticized products			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	Loss to atmosphere during melt forming processes is likely.			
Release or emission factors:	Release or emission factors			
<b>EVALUATION</b>				
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	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/ process technologies) may impact exposures or releases relative to the U.S.
	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	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	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	ECETOC, (1985). An assessment of the occurrence and effects of dialkyl ortho-phthalates in the environment.		
<b>HERO ID:</b>	679967		
<b>Conditions of Use:</b>	Use of plasticized products		
		<b>EXTRACTION</b>	
<b>Parameter</b>	<b>Data</b>		
Release or emission factors:		Release or emission factors	
		<b>EVALUATION</b>	
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	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/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	Low	The assessment is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, such as a consumer DIY scenario that is similar to a worker scenario.
	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	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	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	ECETOC, (1985). An assessment of the occurrence and effects of dialkyl ortho-phthalates in the environment.			
<b>HERO ID:</b>	679967			
<b>Conditions of Use:</b>	Disposal of plasticized products			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Release or emission factors:	Release or emission factors			
<b>EVALUATION</b>				
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	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/ process technologies) may impact exposures or releases relative to the U.S.
	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	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	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.
<b>Overall Quality Determination</b>			<b>Medium</b>	



<b>Study Citation:</b>	ECHA, (2009). Data on manufacture, import, export, uses and releases of dibutyl phthalate (DBP) as well as information on potential alternatives to its use.			
<b>HERO ID:</b>	6316858			
<b>Conditions of Use:</b>	Transportation			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Release or emission factors:	Release or emission factors			
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	Medium	The data are from an OECD country other than the U.S. (Europe).	
	Metric 3: Applicability	Medium	The assessment is for an occupational scenario within the scope of the risk evaluation. Not specific to DIBP.	
	Metric 4: Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment 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	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.	
Overall Quality Determination		Medium		

<b>Study Citation:</b>	ECHA, (2009). Data on manufacture, import, export, uses and releases of dibutyl phthalate (DBP) as well as information on potential alternatives to its use.			
<b>HERO ID:</b>	6316858			
<b>Conditions of Use:</b>	Disposal			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Waste treatment methods and pollution control: nan				
<b>EVALUATION</b>				
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	Medium	The data are from an OECD country other than the U.S. (Europe).
	Metric 3:	Applicability	Medium	The assessment is for an occupational scenario within the scope of the risk evaluation. Not Specific to DIBP.
	Metric 4:	Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment 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	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	ECHA, (2009). Data on manufacture, import, export, uses and releases of dibutyl phthalate (DBP) as well as information on potential alternatives to its use.			
<b>HERO ID:</b>	6316858			
<b>Conditions of Use:</b>	Formulation			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Release or emission factors:	Release or emission factors			
<b>EVALUATION</b>				
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	Medium	The data are from an OECD country other than the U.S. (Europe).
	Metric 3:	Applicability	Medium	The assessment is for an occupational scenario within the scope of the risk evaluation. Not specific to DIBP.
	Metric 4:	Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment 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	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	ECHA, (2009). Data on manufacture, import, export, uses and releases of dibutyl phthalate (DBP) as well as information on potential alternatives to its use.			
<b>HERO ID:</b>	6316858			
<b>Conditions of Use:</b>	Processing into plastics, application of paints/adhesives/etc. to produce articles			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Release or emission factors:	Release or emission factors			
<b>EVALUATION</b>				
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	Medium	The data are from an OECD country other than the U.S. (Europe).
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment 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	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.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	ECHA, (2009). Data on manufacture, import, export, uses and releases of dibutyl phthalate (DBP) as well as information on potential alternatives to its use.			
<b>HERO ID:</b>	6316858			
<b>Conditions of Use:</b>	End-product uses (of articles such as plastics, flooring, coated materials)			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Release or emission factors:	Release or emission factors			
<b>EVALUATION</b>				
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	Medium	The data are from an OECD country other than the U.S. (Europe).	
	Metric 3: Applicability	Low	The assessment is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, such as a consumer DIY scenario that is similar to a worker scenario.	
	Metric 4: Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment 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	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.	
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	ECJRC, (2003). European Union risk assessment report, vol 36: 1,2-Benzenedicarboxylic acid, Di-C9-11-Branched alkyl esters, C10-Rich and Di-”isodecyl”phthalate (DIDP).			
<b>HERO ID:</b>	1588746			
<b>Conditions of Use:</b>	Application of Paints and Coatings			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Release frequency:	The table on Page 68 of the PDF states 300 release days per year for plastisol spread coating.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from the European Union.	
	Metric 3: Applicability	High	Data are for the application of paints and coatings, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (worst-case) but discrete samples not provided and distribution not fully characterized.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by the use of the worst-case value but uncertainty is not addressed.	
Overall Quality Determination		Medium		

<b>Study Citation:</b>	Marx, J. L. (1972). Phthalic acid esters: Biological impact uncertain. Science 46(4056):46-47.
<b>HERO ID:</b>	1335811
<b>Conditions of Use:</b>	Disposal

**EXTRACTION**

Parameter	Data
Description of release source:	Pesticides that contain phthalate carriers may release them directly into air, soil, and water; volatilization and leaching of plasticizers from PVC is another source of undetermined magnitude. In addition, some bacteria, fungi, and plants have the ability to synthesize phthalates.
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**EVALUATION**

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

**Overall Quality Determination****Medium**

<b>Study Citation:</b>	OECD, (2011). Emission scenario document on coating application via spray-painting in the automotive refinishing industry.
<b>HERO ID:</b>	3808976
<b>Conditions of Use:</b>	Use

**EXTRACTION**

Parameter	Data
Description of release source:	Container cleaning, equipment cleaning, coating application (overspray). Releases to air and land.
Release or emission factors:	nan
Release frequency:	250 days/yr
Waste treatment methods and pollution control:	nan
Comments:	Release/Emission Factors: Container cleaning: 0.6%Equipment Cleaning: 2%Spray Coating: 35-80%

**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****Medium**



**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, miscellaneous operations, material storage, leaks, spills USE: Application losses, equipment residues, drum residues. Releases to water, air, land.
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**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****Medium**

**Study Citation:** OECD, (2009). Emission scenario document on adhesive formulation.  
**HERO ID:** 3827299  
**Conditions of Use:** Processing: Adhesive Manufacturing

**EXTRACTION**

Parameter	Data
Description of release source:	Container cleaning, dusts and volatiles from unloading containers, vented losses during mixing, sampling, equipment cleaning, volatiles from loading containers, off-spec products. Releases to water, air and land.
Release quantity:	Provides models for estimating various releases
Release or emission factors:	Release or emission factors
Release frequency:	days/yr equal to number of bt/yr
Waste treatment methods and pollution control:	nan

**EVALUATION**

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

**Overall Quality Determination****High**

<b>Study Citation:</b>	OECD, (2013). Emission scenario document on the industrial use of adhesives for substrate bonding.
<b>HERO ID:</b>	3827300
<b>Conditions of Use:</b>	Commercial/Industrial Use - Adhesives and Sealants

**EXTRACTION**

Parameter	Data
Description of release source:	container cleaning, unloading, equipment cleaning, application losses, curing/drying, trimming. Releases to water, air and land.
Release or emission factors:	nan
Release frequency:	50-365 days/yr
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**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	This ESD was developed by EPA based on U.S. data.
	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 reasonably expected to be representative of current industry conditions.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions, types of adhesives, and end use markets.

**Overall Quality Determination****High**

**Study Citation:** OECD, (2015). Emission scenario document on use of adhesives.  
**HERO ID:** 3833136  
**Conditions of Use:** Adhesive Application

**EXTRACTION**

Parameter	Data
Description of release source:	container cleaning, unloading, equipment cleaning, application losses, curing/drying, trimming.
Release or emission factors:	nan
Release frequency:	50-365 days/yr
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**EVALUATION**

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

**Overall Quality Determination****High**

<b>Study Citation:</b>	OECD, (2010). Emission scenario document on formulation of radiation curable coatings, inks and adhesives.
<b>HERO ID:</b>	3840003
<b>Conditions of Use:</b>	Processing - Paints, Coatings, and Adhesives

**EXTRACTION**

Parameter	Data
Description of release source:	Container cleaning, dusts and volatiles from unloading containers, vented losses during mixing, sampling, equipment cleaning, volatiles from loading containers, filter wastes. Releases to water, air, and land.
Release quantity:	Provides models for estimating various releases
Release or emission factors:	Release or emission factors
Release frequency:	250
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**EVALUATION**

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

**Overall Quality Determination****Medium**

<b>Study Citation:</b>	OECD, (2004). Emission scenario document on additives in rubber industry.			
<b>HERO ID:</b>	4445826			
<b>Conditions of Use:</b>	Rubber Manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	Formulation and processing wastes to wastewater; formulation and processing wastes to air and soil, use of rubber products.			
Release quantity:	Total WW flow rates (m3/day): 10-1,154, mean = 184, 90th percentile = 438			
Release or emission factors:	nan			
<b>EVALUATION</b>				
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 from 2004 but is based on data greater than 20 years old.	
	Metric 5: Sample Size	Medium	Data characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by presenting emission factors for multiple scenarios/additive types but uncertainty is not addressed.	
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	OECD, (2009). Emission scenario document on plastic additives.		
<b>HERO ID:</b>	5079084		
<b>Conditions of Use:</b>	Processing - Plastic Additives		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Description of release source:	Raw material handling, compounding, converting, service life, disposal. Releases to air and water.		
Release or emission factors:	nan		
<b>EVALUATION</b>			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	This ESD was not developed by EPA, but another OECD-member country.
	Metric 3: Applicability	Medium	Data are for multiple in-scope occupational scenarios; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Low	Assessment from 2011 but is based on data greater than 20 years old.
	Metric 5: Sample Size	Medium	Data characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by presenting emission factors for multiple scenarios/addtive types but uncertainty is not addressed.
<b>Overall Quality Determination</b>		<b>Medium</b>	

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



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

**EXTRACTION**

Parameter	Data
Description of release source:	filling and emptying of containers, storage, pipelines, washing and cleaning, recycling and disposal of packaging
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	nan
Comments:	Data is general and not specific to a chemical.

**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**

<b>Study Citation:</b>	OECD, (2011). Emission Scenario Document on the application of radiation curable coatings, inks, and adhesives via spray, vacuum, roll, and curtain coating.
<b>HERO ID:</b>	6568745
<b>Conditions of Use:</b>	Coating, Ink, and Adhesive Application

## EXTRACTION

Parameter	Data
Description of release source:	unloading, sampling, container residue, application losses, equipment cleaning
Release or emission factors:	nan
Release frequency:	250 days/yr
Waste treatment methods and pollution control:	nan

## EVALUATION

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

## Overall Quality Determination

Medium

**Study Citation:** 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 releases. Autorefinish: air filter waste from overspray, stack air.
Release or emission factors:	Release or emission factors
Release frequency:	Auto OEM: sludge pit cleaning: 1 day/yr. All other releases: 250 days/yr. Autorefinish: 170 days/yr.
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**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****Medium**

<b>Study Citation:</b>	U.S. EPA, (2021). Use of additives in plastic compounding – Generic scenario for estimating occupational exposures and environmental releases (Revised draft).
<b>HERO ID:</b>	10366192
<b>Conditions of Use:</b>	Plastics Compounding

**EXTRACTION**

Parameter	Data
Description of release source:	Unloading containers, spillage, Container cleaning, dusts and fugitive emissions from compounding, equipment cleaning.
Release quantity:	Provides models for estimating various fugitive air releases.
Release or emission factors:	Release or emission factors
Release frequency:	148-264
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**EVALUATION**

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

**Overall Quality Determination****High**

<b>Study Citation:</b>	U.S. EPA, (2023). Use of laboratory chemicals - Generic scenario for estimating occupational exposures and environmental releases (Revised draft generic scenario).			
<b>HERO ID:</b>	10480466			
<b>Conditions of Use:</b>	Use - Laboratory Chemicals			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	Container unloading, container cleaning, labware equipment cleaning, during laboratory analyses, waste disposal; Release media: Water, air, landfill			
Release or emission factors:	Release or emission factors			
Release frequency:	260 day/yr			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>		<b>High</b>		

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

**EXTRACTION**

Parameter	Data
Description of release source:	Transfer losses, container cleaning, equipment cleaning, transfer losses during loading.
Release quantity:	Provides methodology to estimate releases based on various parameters including: opening area of cleaning equipment, physical-chemical properties, air velocity, etc.
Release or emission factors:	Release or emission factors
Release frequency:	The number of operating days is given in a range of 174-260 days/yr with an EPA default of 260 days/yr.
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**EVALUATION**

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

**Overall Quality Determination****High**

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

**EXTRACTION**

Parameter	Data
Description of release source:	Unloading transport containers, cleaning transport containers, equipment cleaning, fuel combustion releases.
Release quantity:	Provides models for estimating various fugitive air releases. For combustion, 100% release is assumed and remaining chemical (minus upstream losses) is released.
Release or emission factors:	Release or emission factors
Release frequency:	365.
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**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	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 tank filling methods, and considering emissions from different activities.

**Overall Quality Determination****High**

<b>Study Citation:</b>	U.S. EPA, (2021). Use of additives in plastics converting – Generic scenario for estimating occupational exposures and environmental releases (revised draft).
<b>HERO ID:</b>	11373493
<b>Conditions of Use:</b>	Plastics Converting

**EXTRACTION**

Parameter	Data
Description of release source:	Container cleaning, spillage, dusts and fugitive emissions from converting, equipment cleaning, trimming wastes.
Release quantity:	Provides models for estimating various fugitive air releases
Release or emission factors:	Release or emission factors
Release frequency:	137-254
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**EVALUATION**

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

**Overall Quality Determination****High**



<b>Study Citation:</b>	U.S. EPA, (2024). Emission Scenario Document on fluorocarbon substitutes in blowing agents for manufacture of rigid and flexible foam (draft).			
<b>HERO ID:</b>	12197147			
<b>Conditions of Use:</b>	Manufacture of Polyurethane Foam for Pipeline Pigs			
EXTRACTION				
Parameter	Data			
Description of release source:	Fugitive or stack air releases from unloading DIBP and process operation vapor releases. Wastewater releases to onsite treatment, discharge to POTW (with or without pretreatment), or direct to surface water, incineration, or landfill from container cleaning and equipment cleaning. Releases to incineration or landfill from foam trimming (p. 4-1).			
Release or emission factors:	Release or emission factors			
Release frequency:	249 days/yr (p. 3-2).			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	High	Discrete loss fractions provided, along with 50th and 95th percentile values.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by presenting loss fractions for multiple foam types. Uncertainty isn't addressed.	
Overall Quality Determination		High		

<b>Study Citation:</b>	U.S. EPA, (2014). Generic scenario draft on the use of additives in plastic compounding.
<b>HERO ID:</b>	3827195
<b>Conditions of Use:</b>	Plastics Compounding

**EXTRACTION**

Parameter	Data
Description of release source:	Unloading containers, spillage, Container cleaning, dusts and fugitive emissions from compounding, equipment cleaning
Release quantity:	Provides models for estimating various fugitive air releases
Release or emission factors:	Release or emission factors
Release frequency:	148-264 days/yr
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**EVALUATION**

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

**Overall Quality Determination****High**

<b>Study Citation:</b>	U.S. EPA, (2014). Formulation of waterborne coatings - Generic scenario for estimating occupational exposures and environmental releases -Draft.
<b>HERO ID:</b>	3827197
<b>Conditions of Use:</b>	Formulation of Coatings

**EXTRACTION**

Parameter	Data
Description of release source:	Unloading containers, container cleaning, dispersion and blending operations, sampling, equipment cleaning, filter wastes, loading, off-spec coating.
Release quantity:	Provides models for estimating various fugitive air releases.
Release or emission factors:	nan
Release frequency:	235-350.
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**EVALUATION**

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

**Overall Quality Determination****High**

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

<b>Study Citation:</b>	U.S. EPA, (2004). Additives in plastics processing (compounding) – generic scenario for estimating occupational exposures and environmental release – Draft.
<b>HERO ID:</b>	6311218
<b>Conditions of Use:</b>	incorporation into article as a plasticizer in plastic product manufacturing; incorporation into formulation, mixture, or reaction product as a plasticizer in plastic product manufacturing

**EXTRACTION**

Parameter	Data
Description of release source:	Unloading containers, spillage, Container cleaning, dusts and fugitive emissions from compounding, equipment cleaning
Release quantity:	Provides models for estimating various fugitive air releases
Release or emission factors:	Release or emission factors
Release frequency:	250
Waste treatment methods and pollution control:	Waste treatment methods and pollution control
Comments:	QC Note: This is an early draft of the Plastic Compounding GS and may not provide the most up to data info

**EVALUATION**

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	High	This GS is based on U.S. data
	Metric 3:	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	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:	Medium	Data characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic types, and additive types.

**Overall Quality Determination****High**

<b>Study Citation:</b>	U.S. EPA, (2001). Manufacture and use of printing ink - Generic scenario for estimating occupational exposures and environmental releases (revised draft).
<b>HERO ID:</b>	6311221
<b>Conditions of Use:</b>	Formulation and Use of Printing Inks

**EXTRACTION**

Parameter	Data
Description of release source:	PROC: Packaging disposal, material transfer, ink processing, equipment cleaningUSE: disposal/cleaning of ink container, cleaning printing equipment, ink drying
Release or emission factors:	Release or emission factors
Release frequency:	PROC: 250 days/yrUSE: 250 days/yr
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**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 printing applications, and multiple chemical functions

**Overall Quality Determination****Medium**

<b>Study Citation:</b>	U.S. EPA, (1999). Flexographic printing - generic scenario for estimating occupational exposures and environmental releases: Draft.
<b>HERO ID:</b>	6385709
<b>Conditions of Use:</b>	Flexographic Printing

**EXTRACTION**

Parameter	Data
Description of release source:	Equipment cleaning, fugitive air, stack air.
Release or emission factors:	Release or emission factors
Release frequency:	300 days/yr.
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**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**

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

**EXTRACTION**

Parameter	Data
Description of release source:	PROC: Packaging disposal, material transfer, ink processing, equipment cleaning. VOC and particulate emissions are expected from the unloading of raw materials into the dispersion tank. Additional VOC emissions are expected as a result of heat-up losses and surface evaporation during the dispersion and milling operations as well as during the loading of the final ink product into receiving containers. Additional environmental releases are expected from waste streams associated with container and equipment cleaning. USE: disposal/cleaning of ink container, cleaning printing equipment, ink drying. 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.
Release quantity:	PROC: See Table 2-4 for 2007 TRI data. Air releases = 190,832 lb/yr, Surface water releases = 29 lb/yr, POTW/Wastewater releases = 823 lb/yr, Land releases = 5,561 lb/yr, Other disposal = 51,303 lb/yr. USE: See Table 2-5 for 2007 TRI data based on the type of printing. Depending on the type of printing, Air releases = 14,150 to 5,865,923 lb/yr, Surface water releases = 0 to 275 lb/yr, Wastewater releases = 0 to 3,200 lb/yr, Land releases = 11 to 18,619 lb/yr, Other disposal = 1,767 to 210,010 lb/yr.
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**EVALUATION**

Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Medium	The GS is more than 10 years but no more 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	Uncertainty not addressed. Variability not addressed.

**Overall Quality Determination****Medium**



<b>Study Citation:</b>	U.S. EPA, (2014). Use of additives in the thermoplastic converting industry - generic scenario for estimating occupational exposures and environmental releases.
<b>HERO ID:</b>	6385711
<b>Conditions of Use:</b>	Plastics Converting

**EXTRACTION**

Parameter	Data
Description of release source:	Container cleaning, spillage, dusts and fugitive emissions from converting, equipment cleaning, trimming wastes
Release quantity:	Provides models for estimating various releases
Release or emission factors:	Release or emission factors
Release frequency:	137-254 days/yr
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**EVALUATION**

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

**Overall Quality Determination****High**

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

**EXTRACTION**

Parameter	Data
Description of release source:	container cleaning, equipment cleaning, coating application (overspray), volatile air emissions.
Release or emission factors:	nan
Release frequency:	250 days/yr
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**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****Medium**

<b>Study Citation:</b>	U.S. EPA, (1994). Fabric finishing - generic scenario for estimating occupational exposures and environmental releases: Draft.			
<b>HERO ID:</b>	6385741			
<b>Conditions of Use:</b>	Processing: Fabric, textile, and leather products			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	dumping finishing bath, drum residues			
Release quantity:	Provides method for estimating release to water based on bath size, and on-weight-bath percentage			
<b>EVALUATION</b>				
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 finishing agent types
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	U.S. EPA, (2014). Use of additive in plastic compounding - generic scenario for estimating occupational exposures and environmental releases: Draft.			
<b>HERO ID:</b>	6385748			
<b>Conditions of Use:</b>	Processing - Additive in Plastic Compounding			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	Unloading containers, spillage, Container cleaning, dusts and fugitive emissions from compounding, equipment cleaning, loading. Releases to water, air, and land.			
Release quantity:	Provides models for estimating various releases			
Release or emission factors:	nan			
Release frequency:	148-264			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This GS is based on U.S. data
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be reasonably representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Data characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic types, and additive types.
<b>Overall Quality Determination</b>		<b>High</b>		

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

**EXTRACTION**

Parameter	Data
Description of release source:	1. Container residue from plastic resin transport container released to water, incineration, or landfill.2. Dust generation from forming processes released to water or landfill.3. Fugitive air emissions from forming and molding processes released to water or air.4. Equipment cleaning and cooling water from forming and molding processes released to water, incineration, or landfill.5. Solid waste from trimming operations released to water or landfill.
Release quantity:	Container Residue from Compounding Transport Container: Daily Release from Container Residue (kg/site-day) = Daily Use Rate (kg/site-day) x Loss Fraction Dust Generation from Converting Activities Released to Water or Landfill: Daily release of dust = daily use rate x loss fraction Fugitive Air from Converting Activities Released to Water or Air: Daily release to water (or air) from volatilization = daily use rate x loss fraction Residual from Converting Equipment Cleaning: Daily release from equipment cleaning = daily use rate x loss fraction Trimming Waste: Daily release from trimmings = daily use rate x loss fraction
Release or emission factors:	Release or emission factors
Release frequency:	CEB standard assumption, 250 days per year based on 5 day work week and two weeks per year of operation shut down.
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**EVALUATION**

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

**Overall Quality Determination****Medium**

<b>Study Citation:</b>	U.S. EPA, (1992). Generic scenario document for lube oil additives.			
<b>HERO ID:</b>	8726954			
<b>Conditions of Use:</b>	Manufacture			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	Residual product from equipment cleaning and spillage			
Release quantity:	58 kg/site/day to water7800 kg/yr to land			
Release frequency:	350 days/year			
<b>EVALUATION</b>				
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	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	Uncertainty not addressed. Variability addressed by considering multiple additive types.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	U.S. EPA, (1992). Generic scenario document for lube oil additives.			
<b>HERO ID:</b>	8726954			
<b>Conditions of Use:</b>	Incorporation into formulation, mixture, or reaction product as a fuel additive			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	Spillage during transfer and sampling			
Release quantity:	0.7 kg/site/day to water			
Release frequency:	350 days/year			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	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	Report is based on data greater than 20 years old (1992) and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Data characterized by a range 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	Uncertainty not addressed. Variability addressed by considering multiple additive types.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	U.S. EPA, (1992). Generic scenario document for lube oil additives.			
<b>HERO ID:</b>	8726954			
<b>Conditions of Use:</b>	Use as a fuel additive			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	Release from incineration (burning used oil), dumping, landfilling, and road oiling			
Release quantity:	99,516 kg/site/yr from incineration9,257 kg/site/yr to land			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	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	Report is based on data greater than 20 years old (1992) and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Data characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple additive types.
<b>Overall Quality Determination</b>		<b>Medium</b>		



<b>Study Citation:</b>	APR, (2023). Model Bale Specifications: 1-7 ALL Rigid Plastics.			
<b>HERO ID:</b>	11374516			
<b>Conditions of Use:</b>	Recycling			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Waste treatment methods and pollution control:	Waste treatment methods and pollution control			
Comments:	Source does not contain production, import, or use volume, throughput, or release or emission factors.			
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 is from the U.S.
	Metric 3:	Applicability	High	Data is for recycling, which is an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Data are less than 10 years old (2023).
	Metric 5:	Sample Size	N/A	N/A - Waste treatment methods.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - Waste treatment methods.
Overall Quality Determination			High	

<b>Study Citation:</b>	Canada., G.o. (2020). Phthalate substance grouping – Information sheet.			
<b>HERO ID:</b>	7349060			
<b>Conditions of Use:</b>	All			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:		In Canada, these substances have the potential to be released to the environment, primarily to air and water. Releases may occur during their manufacturing and processing, including transportation and storage, and during the production, use and disposal of products containing them (for example, "down the drain" releases into wastewater systems from use in cosmetics). (p. 4).		
<b>EVALUATION</b>				
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	Report is from Canada.
	Metric 3:	Applicability	Medium	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	Low	Data is qualitative.
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.
<b>Overall Quality Determination</b>			<b>Low</b>	

<b>Study Citation:</b>	Canada,, G.o. (2019). Page 5 - Fifth report on human biomonitoring of environmental chemicals in Canada.			
<b>HERO ID:</b>	9641570			
<b>Conditions of Use:</b>	All			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	PDF Pg. 5”Releases to the environment are associated with anthropogenic activities (Environment and Climate Change Canada and Health Canada, 2017). Releases may occur during the manufacture and processing of phthalates, including transportation and storage, as well as during the production, use, and disposal of products that contain phthalates (Environment and Climate Change Canada and Health Canada, 2017). Although release into air may occur, water is expected to be the primary receiving medium for phthalates, and occurs through wastewater effluents from industrial sources and disperse releases from consumer products (Environment and Climate Change Canada and Health Canada, 2017; Environment Canada and Health Canada 2015d).”			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Canada, an OECD country.	
	Metric 3: Applicability	High	Data are for many in-scope occupational scenarios.	
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	N/A	N/A - Description of release source.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A - Description of release source.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	CDC, (2009). Fourth national report on human exposure to environmental chemicals.			
<b>HERO ID:</b>	664488			
<b>Conditions of Use:</b>	Use of plastic articles			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Description of release source:	Because they are not chemically bound to the plastics to which they are added, phthalates can be released into the environment during use or disposal of the product.			
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	Low	The report is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, such as a consumer DIY scenario that is similar to a worker scenario.
	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 generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	Low	Information is qualitative
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			Medium	

<b>Study Citation:</b>	ECHA, (2012). Committee for Risk Assessment (RAC) Committee for Socio-economic Analysis (SEAC): Background document to the Opinion on the Annex XV dossier proposing restrictions on four phthalates: Annexes.			
<b>HERO ID:</b>	7325405			
<b>Conditions of Use:</b>	emission			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Description of release source:		To the extent the materials contain phthalates these substances may be released and bound to dust in indoor environment. Phthalates present on the surface of wall covering and flooring may be a source for exposure of small children touching the vinyl with fingers, etc. Phthalates present on the surface of wall covering and flooring may be removed by washing and thereby be disposed of with residues from the washing process, e.g., washing water directed to sewer systems.		
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Low	Sampling or analytical methodology is not specified.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from a non-OECD country	
	Metric 3: Applicability	High	The release data are for an occupational scenario within the scope	
	Metric 4: Temporal Representativeness	High	less than 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.	
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		

<b>Study Citation:</b>	ESIG, (2020). SPERC Factsheet – Use in rubber production and processing.
<b>HERO ID:</b>	11360390
<b>Conditions of Use:</b>	Rubber Manufacturing

**EXTRACTION**

Parameter	Data
Description of release source:	Cleaning operations and maintenance operations
Release or emission factors:	Release or emission factors
Release frequency:	300 days/yr
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**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 Europe.
	Metric 3: Applicability	High	Data are for rubber manufacturing, an in-scope, occupational scenario.
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by emission factors for compounds of different solubilities but uncertainty is not addressed.

**Overall Quality Determination****High**

<b>Study Citation:</b>	ESIG, (2012). SPERC fact sheet – Manufacture of substance – Industrial (Solvent-borne).		
<b>HERO ID:</b>	11373487		
<b>Conditions of Use:</b>	Manufacturing		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Release or emission factors:	Release or emission factors		
Release frequency:	300 days/year		
<b>EVALUATION</b>			
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 Europe.
	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 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by describing how to calculate emission factors for multiple scenarios/chemicals but uncertainty is not addressed.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	Gaspar, F. W., Castorina, R., Maddalena, R. L., Nishioka, M. G., Mckone, T. E., Bradman, A. (2014). Phthalate exposure and risk assessment in California child care facilities. Environmental Science & Technology 48(13):7593-7601.			
<b>HERO ID:</b>	2345959			
<b>Conditions of Use:</b>	Commercial use			
EXTRACTION				
Parameter	Data			
Description of release source:	Plasticizers in building materials including vinyl flooring, consumer products, and personal care 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
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted
Overall Quality Determination			High	



<b>Study Citation:</b>	Giuliani, A., Zuccarini, M., Cichelli, A., Khan, H., Reale, M. (2020). Critical Review on the Presence of Phthalates in Food and Evidence of Their Biological Impact. International Journal of Environmental Research and Public Health 17(16):1-43.			
<b>HERO ID:</b>	8338316			
<b>Conditions of Use:</b>	All			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Description of release source: Indeed, they have no chemical linkage with the polymer system and can be lost over time and released into the surrounding environment during production, transport, storage, manufacture, and use and disposal of plastic polymers.				
<b>EVALUATION</b>				
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	Primary authors are from Italy - OECD country.	
	Metric 3: Applicability	Medium	Information applies to multiple in-scope conditions of use but is not specific to DIBP.	
	Metric 4: Temporal Representativeness	High	The report is generally no more than 10 years old.	
	Metric 5: Sample Size	N/A	No sample data.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, and assumptions.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	No scope to address variability and uncertainty.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	Liang, J., Ning, X. A., Kong, M., Liu, D., Wang, G., Cai, H., Sun, J., Zhang, Y., Lu, X., Yuan, Y. (2017). Elimination and ecotoxicity evaluation of phthalic acid esters from textile-dyeing wastewater. Environmental Pollution 231(Pt 1):115-122.
<b>HERO ID:</b>	4259743
<b>Conditions of Use:</b>	Disposal - textile wastewater

**EXTRACTION**

Parameter	Data
Number of sites:	4
Release quantity:	1.84 billion metric tonnes of textile-dyeing wastewater was produced in 2015. Mean conc. of DIBP in waste treatment was 6.58 ug/L
Release or emission factors:	Release or emission factors
Waste treatment methods and pollution control:	Waste treatment methods and pollution control

**EVALUATION**

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data and techniques that do not indicate quality issues. Source is peer reviewed.
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data is from China, a non-OECD country
	Metric 3: Applicability	Low	Data is for textile-dyeing wastewater treatment, which falls into a possible in-scope use but uncertain.
	Metric 4: Temporal Representativeness	High	Data is from 2017 so less than 10 years old
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics, just an average
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Report documents results, methods and assumptions. Data sources generally described.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Addresses variability by sampling multiple sites but does not address uncertainty.

**Overall Quality Determination****Medium**

<b>Study Citation:</b>	Lu, X., Xu, X., Lin, Y., Zhang, Y., Huo, X. (2018). Phthalate exposure as a risk factor for hypertension. Environmental Science and Pollution Research 25(21):20550-20561.		
<b>HERO ID:</b>	4728432		
<b>Conditions of Use:</b>	Manufacturing		
EXTRACTION			
<b>Parameter</b>	<b>Data</b>		
Description of release source: Being not covalently bound with polyvinyl chloride, phthalates can leach, migrate, and volatilize over time into environmental media such as indoor air, atmosphere, and foodstuff (Ait Bamai et al. 2014).			
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	Low	The data are from a non-OECD country, and locality-specific factors (e.g., potentially greater differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S., or the country of origin is not specified.
	Metric 3: Applicability	Low	The report is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, such as a consumer DIY scenario that is similar to a worker scenario.
	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	Low	Information is qualitative
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	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		Medium	

<b>Study Citation:</b>	Lu, X., Xu, X., Lin, Y., Zhang, Y., Huo, X. (2018). Phthalate exposure as a risk factor for hypertension. Environmental Science and Pollution Research 25(21):20550-20561.			
<b>HERO ID:</b>	4728432			
<b>Conditions of Use:</b>	Disposal: E-waste sites			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Description of release source:		The concentration range of total phthalates in the ambient environment of e-waste dismantling areas were 0.31–2.39 mg/kg in soil and 1.81–5.77 mg/kg in plants (dry weight/DW) (Ma et al. 2013). Other data from soils at three e-waste sites, Fengjiang, Nanshan, and Meishu in Taizhou city in China, showed that total phthalate concentrations ranged from 12.57 to 46.67 mg/kg (Liu et al. 2009). Environmental pollutants from informal e-waste recycling area present a high exposure risk to local populations via direct and indirect contact (Awasthi et al. 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 (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	Low	The data are from a non-OECD country, and locality-specific factors (e.g., potentially greater differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S., or the country of origin is not specified.
	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	Low	Information is qualitative
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	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			Medium	

<b>Study Citation:</b>	Manoukian, A., Buiron, D., Temime-Roussel, B., Wortham, H., Quivet, E. (2016). Measurements of VOC/SVOC emission factors from burning incenses in an environmental test chamber: influence of temperature, relative humidity, and air exchange rate. Environmental Science and Pollution Research 23(7):6300-6311.			
<b>HERO ID:</b>	3161045			
<b>Conditions of Use:</b>	Laboratory study			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Release or emission factors:	Release or emission factors			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Source is peer reviewed so likely to contain and use credible data.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Source is from France, an OECD country.	
	Metric 3: Applicability	Low	Source is for a non-occupational scenario but contains emission factor information that could be used to evaluate releases or exposures	
	Metric 4: Temporal Representativeness	High	Data is less than 10 years old.	
	Metric 5: Sample Size	Medium	Range with uncertain statistics	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Report documents methods, results, and assumptions and sources are generally described.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Provides variability by testing across different experimental parameters. Does not address uncertainty	
Overall Quality Determination		Medium		

<b>Study Citation:</b>	U.S. EPA, (2012). Phthalates action plan.			
<b>HERO ID:</b>	4565597			
<b>Conditions of Use:</b>	General industrial manufacturing, processing, or use			
EXTRACTION				
Parameter	Data			
Description of release source:		Phthalates are released to the environment from multiple sources including industrial releases, the disposal of manufacturing, processing and industrial wastes, municipal solid waste, land application of sewage sludge, and release from products containing phthalates. Only two (DBP and DEHP) of the 8 phthalates are listed on EPA’s Toxics Release Inventory (TRI).list of toxic chemicals. The available release data for these two phthalates indicate that releases of phthalates can be expected to all primary environmental media.		
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	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	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		

<b>Study Citation:</b>	Wormuth, M., Scheringer, M., Vollenweider, M., Hungerbuhler, K. (2006). What are the sources of exposure to eight frequently used phthalic acid esters in Europeans?. Risk Analysis 26(3):803-824.
<b>HERO ID:</b>	680214
<b>Conditions of Use:</b>	Consumer use

EXTRACTION	
Parameter	Data
Production, import, or use volume:	Several million tons of phthalates are used per year worldwide in the production of soft polyvinyl chloride (PVC) and other plastics that are contained in many consumer products. // Table 7 has use rates of personal care products (amount applied per use): 500-3,000 mg/use for deodorant; 650-750 mg/use for perfume; 1,200 mg/use for aftershave; 3,700-10,000 mg/use for hair styling; 8,000-16,400 mg/use for shampoo; 3,000-7,000 mg/use for skin care; 280-3,060 mg/use for nail care; 490 mg/use for makeup; 500-1,400 mg/use for baby products.
Chemical concentration:	Table 5 has min/mean/max concentrations in consumer products: 0 mg/kg in gloves; 2,667 mg/kg (mean) in paints; 33,600 mg/kg (mean) in adhesives; 0 mg/kg (mean) in deodorant; 0 mg/kg (mean) in perfumes; 0 mg/kg (mean) in aftershaves; 0 mg/kg (mean) in hair styling products; 0 mg/kg (mean) in shampoo; 0 mg/kg (mean) in skin care products; 0 mg/kg (mean) in nail care; 0 mg/mk (mean) in makeup; 0 mg/kg (mean) in baby product

		EVALUATION	
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The model is free of mathematical errors and is based on scientifically sound approaches or methods. Equations and choice of parameter values are appropriate for the model's application (note: peer review may address appropriate application).
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/ process technologies) may impact exposures or releases relative to the U.S.
	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	The model is based on data that are generally more than 10 years but no more than 20 years old. However, the model is based on operations, equipment, and worker activities are expected to be reasonably representative of current 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	High	The model characterizes variability and uncertainty in the results.

## Overall Quality Determination

**High**

<b>Study Citation:</b>	Burgess, W. A. (1991). Potential exposures in the manufacturing industry—Their recognition and control. :595-674.		
<b>HERO ID:</b>	1267867		
<b>Conditions of Use:</b>	Use		
EXTRACTION			
Parameter	Data		
Process description:	In the industrial setting, paints can be applied to parts by 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. Here, paint is conveyed from a paint reservoir by either siphon pickup created by airflow or a pressurized system. Compressed air atomizes the paint at the nozzle to form droplets or mist, releases the droplet cloud from the gun and conveys it to the workpiece. During powder coating, the fluidized powder is conveyed through a corona discharge where the powder particles pick up a negative charge. They are then directed by the electrostatic field to the grounded workpiece and deposit a uniform coating.		
Throughput:	A 6-in wide brush may use 7 gallons of paint per day. A 9-in roller may use 14 gal/day, and air spray use varies from 10-70 gal/day.		
Chemical concentration:	Powder paints contain 50-60% resin and hardener, 50-40% pigments and fillers, and 1-2% additives.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	Medium	Data are for the use of paints and coatings, but are a general model, and not for one specific 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 distribution characterized by limited statistics (means, standard deviations) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability is addressed by including different paint application techniques. Uncertainty isn’t addressed.
Overall Quality Determination		High	



<b>Study Citation:</b>	Cousins, A. P., Remberger, M., Kaj, L., Ekheden, Y., Dusan, B., Brorstroem-Lunden, E. (2007). Results from the Swedish National Screening Programme 2006. Subreport 1: Phthalates. GRA and I(GRA and I):39.		
<b>HERO ID:</b>	675060		
<b>Conditions of Use:</b>	Use (general use, not differentiated)		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	Swedish use volume was 49 tonnes in 2005 (for 102 preparations, mainly glue, fillers, process regulators - see Table 5)		
<b>EVALUATION</b>			
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	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/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment 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. 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	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	EC/HC, (2015). State of the science report: Phthalate substance grouping: Medium-chain phthalate esters: Chemical Abstracts Service Registry Numbers: 84-61-7; 84-64-0; 84-69-5; 523-31-9; 5334-09-8; 16883-83-3; 27215-22-1; 27987-25-3; 68515-40-2; 71888-89-6.		
<b>HERO ID:</b>	3688160		
<b>Conditions of Use:</b>	Cosmetics		
EXTRACTION			
<b>Parameter</b>	<b>Data</b>		
Chemical concentration:	Concentration in cosmetics ranged from ND to 58.9 ug/g (Tab 9-8).		
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	Medium	The data are from an OECD country other than the U.S. (Canada).
	Metric 3: Applicability	Low	The assessment is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, such as a consumer DIY scenario that is similar to a worker scenario.
	Metric 4: Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 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	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

<b>Study Citation:</b>	EC/HC, (2015). State of the science report: Phthalate substance grouping: Medium-chain phthalate esters: Chemical Abstracts Service Registry Numbers: 84-61-7; 84-64-0; 84-69-5; 523-31-9; 5334-09-8; 16883-83-3; 27215-22-1; 27987-25-3; 68515-40-2; 71888-89-6.		
<b>HERO ID:</b>	3688160		
<b>Conditions of Use:</b>	Childcare products		
EXTRACTION			
Parameter	Data		
Chemical concentration:	Concentration in childcare articles ranged from ND to 61.7% (Tab 9-5).		
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	Medium	The data are from an OECD country other than the U.S. (Canada).
	Metric 3: Applicability	Low	The assessment is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, such as a consumer DIY scenario that is similar to a worker scenario.
	Metric 4: Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 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	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

<b>Study Citation:</b>	EC/HC, (2015). State of the science report: Phthalate substance grouping: Medium-chain phthalate esters: Chemical Abstracts Service Registry Numbers: 84-61-7; 84-64-0; 84-69-5; 523-31-9; 5334-09-8;16883-83-3; 27215-22-1; 27987-25-3; 68515-40-2; 71888-89-6.		
<b>HERO ID:</b>	3688160		
<b>Conditions of Use:</b>	Production and life cycle		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	Production and use of DCHP in US estimated to be 227000– < 454000 kg in 2006 (Table 4-2).		
Life cycle description:	Major uses identified for DIBP are in adhesives and sealants used in construction and/or in the automotive sector. Other applications are as plasticizer in the production of plastic, and used in manufactured items such as electrical and electronics, and children’s toys (p. 3 and Tab 5-1).		
Comments:	Table 5.2 for uses		
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	Medium	The data are from an OECD country other than the U.S. (Canada).
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 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	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

<b>Study Citation:</b>	ECETOC, (1985). An assessment of the occurrence and effects of dialkyl ortho-phthalates in the environment.		
<b>HERO ID:</b>	679967		
<b>Conditions of Use:</b>	Manufacturing		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	About 2.7 x 10^6 tonnes/year of total phthalates are produced. DIBP accounts for 1-10% of the tonnage. Page 4.		
<b>EVALUATION</b>			
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	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/ process technologies) may impact exposures or releases relative to the U.S.
	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	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	Medium	The assessment provides only limited discussion of the variability and uncertainty in the results.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	ECHA, (2012). Committee for Risk Assessment (RAC) Committee for Socio-economic Analysis (SEAC): Background document to the Opinion on the Annex XV dossier proposing restrictions on four phthalates.		
<b>HERO ID:</b>	3661424		
<b>Conditions of Use:</b>	Manufacture, import, export		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	Tonnage by end use market in EU in Table 2: a total of 10,750 t/y is manufactured for use in articles, 0 t/y is imported or exported		
Life cycle description:	64.5% used in articles		
<b>EVALUATION</b>			
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	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/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment 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	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	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	ECHA, (2012). Committee for Risk Assessment (RAC) Committee for Socio-economic Analysis (SEAC): Background document to the Opinion on the Annex XV dossier proposing restrictions on four phthalates.			
<b>HERO ID:</b>	3661424			
<b>Conditions of Use:</b>	Plastics			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Life cycle description:	The main use (94%) of the four phthalates contained in articles proposed for restriction is in PVC. Minor uses are in non-PVC polymers and non-polymers. Uses include: Flooring (and heavy wall covering), Insulation on wires and cables, Electronic devices, Plast coated fabric and film/sheets used for bags and brief/suitcases and similar items, Plast coated fabrics and film/sheets used for tablecloth, curtains, shower curtains and similar items (not industrial uses), Carpet tiles/squares produced with (typically) PVC-foam as back cover, Water- and air mattresses, Plast coated wallpaper/tapestry, Footwear, Bathing equipment (swim-coats/wings/belts and pools - inflatable and others), Balls for training and physical exercises, Others: Erasing rubber			
Chemical concentration:	concentrations of the phthalates in articles are between 25 and 50%. DIBP is 0.65-5.71% in flooring per Table 4, <= 6.9% per narrative. 1-5% in bags. he analyses showed that 4 oilcloths had a content of DEHP above 1% (up to 25%), the concentration of DBP and DIBP were below 0.1% in all of the analysed products and BBP was not detected in any of the oilcloths and dinner mats. None of the analysed tiles contained these four phthalates in concentrations above 0.1%. Plasticiser concentrations in PVC in water beds are assumed to similar to the film used in air mattresses, namely 20-30%. he Danish EPA has analysed 13 air mattresses for the content of DEHP, DBP, DIBP and BBP (Danish EPA, 2010a). Four of the analysed mattresses had a concentration of DEHP above 1% varying from 8.2 to 30.4%. DIBP was detected in one of the mattresses in concentrations below 0.1% and DBP and BBP were not detected in any of the analysed mattresses. Also see Tables 14 and 19.			
<b>EVALUATION</b>				
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	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/ process technologies) may impact exposures or releases relative to the U.S.	
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.	
	Metric 4: Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 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	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.	
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Study Citation:	ECHA, (2012). Committee for Risk Assessment (RAC) Committee for Socio-economic Analysis (SEAC): Background document to the Opinion on the Annex XV dossier proposing restrictions on four phthalates.		
HERO ID:	3661424		
Conditions of Use:	Plastics		
Domain	Metric	EVALUATION Rating	Comments
Overall Quality Determination		High	



<b>Study Citation:</b>	ECHA, (2009). Data on manufacture, import, export, uses and releases of dibutyl phthalate (DBP) as well as information on potential alternatives to its use.			
<b>HERO ID:</b>	6316858			
<b>Conditions of Use:</b>	Life cycle			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Life cycle description:		P. 35: The application of DIBP ranges from the plasticisation of PVC to the production of paints, printing inks and adhesives. DIBP is, like DBP, a fast fusing plasticiser which by itself it is too volatile for PVC applications (BASF 2008b). It is frequently used as a gelling aid in combination with other plasticisers. It is used as plasticiser for nitrocellulose, cellulose ether, and polyacrylate and polyacetate dispersions.		
<b>EVALUATION</b>				
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	Medium	The data are from an OECD country other than the U.S. (Europe).
	Metric 3:	Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	N/A	Process description. Information is qualitative.
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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	ECHA, (2009). Data on manufacture, import, export, uses and releases of dibutyl phthalate (DBP) as well as information on potential alternatives to its use.			
<b>HERO ID:</b>	6316858			
<b>Conditions of Use:</b>	Formulation			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Process description:	Table 2-1: Formulation of adhesives/sealant: Use in closed batch process (synthesis or formulation) Industrial setting; Use in batch and other process (synthesis) where opportunity for exposure arises. Industrial setting. Formulation of lacquers and paint: Use in closed batch process (synthesis or formulation) Industrial setting; Use in batch and other process (synthesis) where opportunity for exposure arises. Industrial setting. // Section 2.2.1: For polymer products, "formulation" means production of semi-final products, such as PVC compound, which is pre-mixed, extruded PVC granulate ready for production of PVC end-product (e.g. hoses or toys), or plastisol, a pasty mixture (or "paste") of constituents prepared for spread coating of textiles or other materials.			
<b>EVALUATION</b>				
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	Medium	The data are from an OECD country other than the U.S. (Europe).
	Metric 3:	Applicability	Medium	The assessment is for an occupational scenario within the scope of the risk evaluation. Not specific to DIBP.
	Metric 4:	Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	N/A	Information is qualitative.
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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	ECHA, (2009). Data on manufacture, import, export, uses and releases of dibutyl phthalate (DBP) as well as information on potential alternatives to its use.		
<b>HERO ID:</b>	6316858		
<b>Conditions of Use:</b>	Processing into plastics, application of paints/adhesives/etc. to produce articles		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Process description:	Table 2-1: Compounding of polymer: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact). Industrial setting. Calendering of polymer: Calendering operations. Industrial setting. Spread coating (with plastisol):Roller application or brushing of adhesive and other coating. Industrial or non-industrial setting. Application of adhesives/ sealant: Spraying in industrial settings and applications. Industrial setting; Roller application or brushing of adhesive and other coating. Industrial or non-industrial setting; Hand-mixing with intimate contact and only PPE available. Nonindustrial setting. Painting (application of lacquers and paint): Spraying in industrial settings and applications. Industrial setting; Spraying outside industrial settings and/or applications.// Section 2.2.1: Here, "processing" is the production of the polymer products themselves (hoses, toys, etc.). // See additional explanation on p. 22.		
<b>EVALUATION</b>			
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	Medium	The data are from an OECD country other than the U.S. (Europe).
	Metric 3: Applicability	Medium	The assessment is for an occupational scenario within the scope of the risk evaluation. Not specific to DIBP.
	Metric 4: Temporal Representativeness	Medium	The assessment captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The completed exposure or risk assessment is generally, more than 10 years but no more than 20 years old.
	Metric 5: Sample Size	N/A	Information is qualitative.
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.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	EPA,, Danish (2011). Annex XV restriction report: Proposal for a restriction, version 2. Substance name: bis(2-ehlylhexyl)phthlate (DEHP), benzyl butyl phthalate (BBP), dibutyl phthalate (DBP), diisobutyl phthalate (DIBP).		
<b>HERO ID:</b>	7265437		
<b>Conditions of Use:</b>	Manufacture, import, export		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	Tonnage by end use market in Table 7: a total of 10,750 t/y is manufactured for use in articles, 0 t/y is imported or exported		
Life cycle description:	64.5% used in articles		
Chemical concentration:	Table 9 provides conc. info.		
<b>EVALUATION</b>			
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	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/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 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	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	EPA,, Danish (2011). Annex XV restriction report: Proposal for a restriction, version 2. Substance name: bis(2-ethylhexyl)phthlate (DEHP), benzyl butyl phthalate (BBP), dibutyl phthalate (DBP), diisobutyl phthalate (DIBP).		
<b>HERO ID:</b>	7265437		
<b>Conditions of Use:</b>	Plastics		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	The main use (94%) of the four phthalates contained in articles proposed for restriction is in PVC. Minor uses are in non-PVC polymers and non-polymers. Uses include: Flooring (and heavy wall covering), Insulation on wires and cables, Electronic devices, Plast coated fabric and film/sheets used for bags and brief/suitcases and similar items, Plast coated fabrics and film/sheets used for tablecloth, curtains, shower curtains and similar items (not industrial uses), Carpet tiles/squares produced with (typically) PVC-foam as back cover, Water- and air mattresses, Plast coated wallpaper/tapestry, Footwear, Bathing equipment (swim-coats/wings/belts and pools - inflatable and others), Balls for training and physical exercises, Others: Erasing rubber		
Chemical concentration:	concentrations of the phthalates in articles are between 25 and 50%. DIBP is 0.65-5.71% in flooring per Table 9, <= 6.9% per narrative. 1-5% in bags. he analyses showed that 4 oilcloths had a content of DEHP above 1% (up to 25%), the concentration of DBP and DIBP were below 0.1% in all of the analysed products and BBP was not detected in any of the oilcloths and dinner mats. None of the analysed tiles contained these four phthalates in concentrations above 0.1%. Plasticiser concentrations in PVC in water beds are assumed to similar to the film used in air mattresses, namely 20-30%. he Danish EPA has analysed 13 air mattresses for the content of DEHP, DBP, DIBP and BBP (Danish EPA, 2010a). Four of the analysed mattresses had a concentration of DEHP above 1% varying from 8.2 to 30.4%. DIBP was detected in one of the mattresses in concentrations below 0.1% and DBP and BBP were not detected in any of the analysed mattresses.		
<b>EVALUATION</b>			
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	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/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The assessment is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 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	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
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Study Citation:	EPA,, Danish (2011). Annex XV restriction report: Proposal for a restriction, version 2. Substance name: bis(2-ehthylhexyl)phthlate (DEHP), benzyl butyl phthalate (BBP), dibutyl phthalate (DBP), diisobutyl phthalate (DIBP).		
HERO ID:	7265437		
Conditions of Use:	Plastics		
Domain	Metric	EVALUATION Rating	Comments
Overall Quality Determination		High	

<b>Study Citation:</b>	Frery, N., Santonen, T., Porras, S. P., Fucic, A., Leso, V., Bousoumah, R., Duca, R. C., Yamani, El, M., Kolossa-Gehring, M., Ndaw, S., Viegas, S., Iavicoli, I. (2020). Biomonitoring of occupational exposure to phthalates: A systematic review. International Journal of Hygiene and Environmental Health 229:13548.			
<b>HERO ID:</b>	7978498			
<b>Conditions of Use:</b>	Manufacture and import of all phthalates			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	Phthalates (also known as phthalate esters or esters of phthalic acid) are a group of plasticizers with a worldwide production volume of around 5.5 million tons per year			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from multiple countries. Some references listed use U.S. data, but the sources also references multiple international data where most are OECD countries	
	Metric 3: Applicability	High	Data are for manufacturing, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	N/A	Process description.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty is addressed by listed approximate value of volume manufactured. Variability is not addressed.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	Gao, C. J., Kannan, K. (2020). Phthalates, bisphenols, parabens, and triclocarban in feminine hygiene products from the United States and their implications for human exposure. Environment International 136:105465.			
<b>HERO ID:</b>	6957637			
<b>Conditions of Use:</b>	Use			
EXTRACTION				
Parameter	Data			
Chemical concentration:	Mean DIBP concentrations: Pads: 413 ng/g Panty Liners: 817 ng/g Tampons: 128 ng/g Wipes: 75.6 ng/g Bacterial Creams: 2.92 ng/g Deodorant sprays: <LOD Powders: 1.83 ng/g			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	Low	Data are for consumer use of Personal care products, which is similar to the in-scope occupational scenario use of fabric products and textiles.	
	Metric 4: Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (means, medians, ranges) 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 in the limits of detection and sampling methodologies. Variability is addressed by sampling different products and product brands.	
Overall Quality Determination		High		



<b>Study Citation:</b>	Lee, M., Kim, J. H., Lee, D., Kim, J., Lim, H., Seo, J., Park, Y. K. (2018). Health risk assessment on hazardous ingredients in household deodorizing products. International Journal of Environmental Research and Public Health 15(4):744.		
<b>HERO ID:</b>	4730751		
<b>Conditions of Use:</b>	Use of deodorizing products		
EXTRACTION			
<b>Parameter</b>	<b>Data</b>		
Throughput:	0.55-1.02 g/s during spray use		
Chemical concentration:	non-detect in 47 products		
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	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/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	Low	The assessment is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, such as a consumer DIY scenario that is similar to a worker scenario.
	Metric 4: Temporal Representativeness	High	The assessment captures operations, equipment, and worker activities expected to be representative of current conditions. EPA has no reason to believe exposures have changed. The completed exposure or risk assessment is generally no more than 10 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	High	The assessment addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

<b>Study Citation:</b>	Marx, J. L. (1972). Phthalic acid esters: Biological impact uncertain. Science 46(4056):46-47.		
<b>HERO ID:</b>	1335811		
<b>Conditions of Use:</b>	Manufacturing		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	Approximately 1 billion pounds of phthalic acid esters were made in 1972.		
Chemical concentration:	Phthalate plasticizers may account for as much as 40 percent of the final weight of PVC.		
<b>EVALUATION</b>			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Assessment uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.
	Metric 3: Applicability	High	Data are for the production of phthalates, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old and industry conditions that are expected to be outdated.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty is addressed by discussing differences between studies. Variability isn’t addressed.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	NICNAS, (2015). Priority existing chemical draft assessment report: Diisodecyl Phthalate & Di-n-octyl Phthalate.			
<b>HERO ID:</b>	6836808			
<b>Conditions of Use:</b>	Use in plastic products as a plasticizer			
EXTRACTION				
Parameter	Data			
Process description:	Minimal information is available in the published literature on the subject of phthalate substitution. A number of phthalates and their functions are listed in the INCI dictionary, e.g. DMP, DEP, DBP and DEHP, all of which have listed functions as fragrance ingredients, plasticisers and solvents. However, the Scientific Committee on Consumer Products (SCCP) opinion on phthalates in cosmetic products concluded that among the phthalates found in a study of 36 perfumes (Greenpeace International 2005), only DMP (0.3%) and DEP (up to 2.23%) are likely to have been deliberately added, while DBP, DIBP (diisobutyl phthalate—a possible substitute for DBP), DEHP, DINP and DIDP are likely to be present as traces and/or impurities leaching from plastic materials during production or storage (SCCP 2007). This information relates to use in perfume samples and there is no information available to allow extrapolation from perfumes to other cosmetics			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Australia, an OECD country.
	Metric 3:	Applicability	Medium	Data are for occupational scenarios for DIDP, which is similar to the in-scope occupational scenarios for DIBP.
	Metric 4:	Temporal Representativeness	High	Assessment is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete 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	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			High	

<b>Study Citation:</b>	OECD, (2011). Emission scenario document on coating application via spray-painting in the automotive refinishing industry.			
<b>HERO ID:</b>	3808976			
<b>Conditions of Use:</b>	Use			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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)			
Life cycle description:	Automotive Coating Application			
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:	Op days: 250 days/yr. 0.25-12 gal coating/site-day, depending on number of jobs Also provides method for adjsutng the use rate based on the type of coating product used			
Number of sites:	32,296			
Chemical concentration:	15-25%			
<b>EVALUATION</b>				
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.	
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	OECD, (2009). Emission scenario documents on coating industry (paints, lacquers and varnishes).		
<b>HERO ID:</b>	3827298		
<b>Conditions of Use:</b>	Processing and Use: Formulation of Coatings and Use of Coatings		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	3.2 million tonnes coating/yr		
Life cycle description:	Formulation of Coatings and Use of Coatings		
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:	In the UK and EU: 60,330 automotive application sites; 33 metal coating application sites		
Chemical concentration:	Provides conc. estimates based on the chemical function, not chemical specific.		
<b>EVALUATION</b>			
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
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	OECD, (2009). Emission scenario document on adhesive formulation.		
<b>HERO ID:</b>	3827299		
<b>Conditions of Use:</b>	Processing: Adhesive Manufacturing		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	15.8-4,990 million kg adhesive/yr		
Life cycle description:	Formulation of Adhesives		
Process description:	Unloading raw materials from containers into mixing vessel, mixing, packaging/on-site storage		
Throughput:	Batch Size: 4000 kg or 1,000 gallons of adhesive/bt. Op days & Batches per day: Equal to the number of batches. Provides methodology for estimating throughput based on the amount of adhesive produced, and the concentration of the chemical in the adhesive.		
Number of sites:	Provides methodology for estimating number of sites based on chemical PV, the adhesive use rate, and the concentration of the chemical in the adhesive formulation		
Chemical concentration:	Provides conc. estimates based on chemical function, not chemical specific.		
<b>EVALUATION</b>			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be reasonably representative of current industry conditions.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions and types of adhesives.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	OECD, (2013). Emission scenario document on the industrial use of adhesives for substrate bonding.		
<b>HERO ID:</b>	3827300		
<b>Conditions of Use:</b>	Commercial/Industrial Use - Adhesives and Sealants		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	1,500 - 9,100,000 kg adhesive/site-yr		
Life cycle description:	Adhesive Application		
Process description:	unloading, dilute and mix (optional), application (roll, spray, curtain, bead/syringe), drying/curing, product finishing		
Throughput:	Op days: 50-365 days/yr. Provides methodology for estimating throughput based on the amount of adhesive used, and the concentration of the chemical in the formulation		
Number of sites:	541-22,294		
Chemical concentration:	Provides conc. estimates based on chemical function and adhesive type, not chemical specific.		
<b>EVALUATION</b>			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be reasonably representative of current industry conditions.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions, types of adhesives, and end use markets.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	OECD, (2015). Emission scenario document on use of adhesives.			
<b>HERO ID:</b>	3833136			
<b>Conditions of Use:</b>	Adhesive Application			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	1,500 - 9,100,000 kg adhesive/site-yr.			
Process description:	unloading, dilute and mix (optional), application (roll, spray, curtain, bead/syringe), drying/curing, product finishing.			
Throughput:	Provides methodology for estimating throughput based on the amount of adhesives used, and the concentration of the chemical in the formulation.			
Chemical concentration:	Provides conc. estimates based on chemical function and adhesive type, not chemical specific.			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data.	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions, types of adhesives, and end use markets.	
<b>Overall Quality Determination</b>		<b>High</b>		



<b>Study Citation:</b>	OECD, (2010). Emission scenario document on formulation of radiation curable coatings, inks and adhesives.		
<b>HERO ID:</b>	3840003		
<b>Conditions of Use:</b>	Processing - Paints, Coatings, and Adhesives		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	0.7-69.87 million kg coating/ink/adhesive/yr		
Life cycle description:	Formulation of Coatings, inks, and adhesives		
Process description:	Preheating (optional), Unloading raw materials from containers into mixing kettle, mixing, filtering, packaging		
Throughput:	Op days: 250 days/yr. Provides methodology for estimating throughput based on the amount of product produced, and the concentration of the chemical in the formulation		
Number of sites:	Provides methodology for estimating number of sites based on chemical PV, the use rate, and the concentration of the chemical in the formulation		
Chemical concentration:	Provides conc. estimates based on chemical function, not chemical specific.		
<b>EVALUATION</b>			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This ESD was developed by EPA based on U.S. data
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions and types of UV curable products.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	OECD, (2004). Emission scenario document on additives in rubber industry.			
<b>HERO ID:</b>	4445826			
<b>Conditions of Use:</b>	Rubber Manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	Provides total synthetic rubber production and synthetic and natural rubber consumption in various EU (including UK) countries indicating EU accounts for 25% of world synthetic rubber production, and percentage used for various end-use products, and market share of various rubbers.			
Process description:	Mastication and creation of mixtures, shaping, vulcanization/curing.			
Throughput:	Provides throughputs of various rubber products at a generic point source.			
Chemical concentration:	Provides conc. estimates based on additive function, not chemical specific.			
<b>EVALUATION</b>				
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 from 2004 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 various additive functions, end-use products, and types of rubber.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	OECD, (2009). Emission scenario document on plastic additives.		
<b>HERO ID:</b>	5079084		
<b>Conditions of Use:</b>	Processing - Plastic Additives		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	Provides % of polymers used for various end-use applications		
Life cycle description:	Plastics Compounding and Converting		
Process description:	Provides descriptions for a variety of closed, partially open, and open compounding and converting processing. Including the following compounding processes: tumbling, ball blending, gravity mixers, paddle mixers, intensive vortex mixers, banbury mixers, two roll mills, and extruder mixing. And the following converting processes: extrusion, injection molding, compression molding, extrusion blow molding, injection blow molding, film extrusion, extrusion coating, thermoforming, calendering, hand lay up, spray techniques, and filament winding. ESD also provides a break down of the % and volume of polymers used in each process in the UK.		
Throughput:	Provides methodology for estimating throughput of polymers and additives		
Number of sites:	4000 sites in UK		
Chemical concentration:	Provides conc. estimates based on additive function in various plastics, not chemical specific.		
<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	OECD, (2011). Emission scenario document on the chemical industry.			
<b>HERO ID:</b>	6306753			
<b>Conditions of Use:</b>	Manufacture, processing, use			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Life cycle description:	Manufacture, Formulation of processing aids, processing as a reactant, use of processing aids			
Process description:	General synthesis process consists of reaction, handling/transportation, isolation, handling/transportation, purification, handling/transportation, then either reaction to make another chemical or on to the next life cycle stage			
<b>EVALUATION</b>				
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	The assessment is for an occupational scenario within the scope of the risk evaluation, but data is general and not specific to DIBP.
	Metric 4:	Temporal Representativeness	Low	Assessment from 2011 but is based on data greater than 20 years old.
	Metric 5:	Sample Size	N/A	N/A - This metric is not applicable to the data being extracted (process description only)
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted (process description only)
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	OECD, (2009). Emission scenario document on transport and storage of chemicals.		
<b>HERO ID:</b>	6393282		
<b>Conditions of Use:</b>	Transportation and Storage		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
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		
Physical form:	liquid, solid, gas		
Comments:	Data is general and not specific to a chemical.		
<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	OECD, (2011). Emission Scenario Document on the application of radiation curable coatings, inks, and adhesives via spray, vacuum, roll, and curtain coating.			
<b>HERO ID:</b>	6568745			
<b>Conditions of Use:</b>	Application of Adhesives and Sealants			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	0.7-69.84 million kg coating/ink/adhesive/yr.			
Process description:	Unloading from containers, dilute and mix (optional), application (roll, spray, curtain), UV/EB curing.			
Throughput:	Provides methodology for estimating throughput based on the amount of product produced, and the concentration of the chemical in the formulation.			
Number of sites:	Provides methodology for estimating number of sites based on chemical PV, the use rate, and the concentration of the chemical in the formulation.			
Chemical concentration:	Provides conc. estimates based on chemical function, not chemical specific.			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	This ESD was developed by EPA based on U.S. data.
	Metric 3:	Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4:	Temporal Representativeness	Low	Assessment is based on data greater than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering various chemical functions and types of UV curable products.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Porras, S. P., Koponen, J., Hartonen, M., Kiviranta, H., Santonen, T. (2020). Non-occupational exposure to phthalates in Finland. Toxicology Letters 332:107-117.			
<b>HERO ID:</b>	6957499			
<b>Conditions of Use:</b>	non-occupational; general population			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	Phthalates have been widely used as plasticizers to soften PVCplastics at volumes of millions of tons per year.			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Finland, an OECD country.	
	Metric 3: Applicability	Low	Data are for non-occupational scenario, e.g., general population, which is similar to the the in-scope occupational scenarios from commercial or consumer uses.	
	Metric 4: Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old, 2020.	
	Metric 5: Sample Size	N/A	production information.	
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.	
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	Science Applications International Corporation, (1996). Generic scenario for automobile spray coating: Draft report.		
<b>HERO ID:</b>	6311222		
<b>Conditions of Use:</b>	Automotive Coating Application		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	Auto OEM: 166,00 cars painted/yr. Autorefinish: 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		
Throughput:	Auto OEM: 250 days/yr. Autorefinish: 170 days/yr.		
Number of sites:	Auto OEM: 61 sites. Autorefinish: 1000’s of sites.		
<b>EVALUATION</b>			
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.
<b>Overall Quality Determination</b>		<b>Medium</b>	



<b>Study Citation:</b>	U.S. EPA, (2021). Use of additives in plastic compounding – Generic scenario for estimating occupational exposures and environmental releases (Revised draft).			
<b>HERO ID:</b>	10366192			
<b>Conditions of Use:</b>	Plastics Compounding			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Process description:	Polymer pellets/resins received, blending/compounding into masterbatch, extrusion/shaping, packaging.			
Throughput:	Provides methodology for estimating throughput based on the amount of plastic produced, and the concentration of the chemical additive in the plastic.			
Number of sites:	Provides methodology for estimating number of sites based on chemical PV, the amount of plastic produced, and the concentration of the chemical additive in the plastic.			
Chemical concentration:	Provides conc. estimates based on additive function in various plastics, not chemical specific.			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data.	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic and additive types.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	U.S. EPA, (2023). Use of laboratory chemicals - Generic scenario for estimating occupational exposures and environmental releases (Revised draft generic scenario).			
<b>HERO ID:</b>	10480466			
<b>Conditions of Use:</b>	Use - Laboratory Chemicals			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	Provides methodology to estimate annual use rate.			
Life cycle description:	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 wast			
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.			
<b>EVALUATION</b>				
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
<b>Overall Quality Determination</b>			<b>High</b>	

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

<b>Study Citation:</b>	U.S. EPA, (2021). Use of chemicals in fuels and related products - Generic scenario for estimating occupational exposures and environmental releases (Methodology review draft).			
<b>HERO ID:</b>	11203977			
<b>Conditions of Use:</b>	Fuels and Fuel Additives			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	95.3 billion gallons of gasoline were sold in 2018.			
Process description:	Chemicals 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. At 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. During 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.			
Throughput:	Provides methodology for estimating throughput based on use rates and operating days/yr.			
Number of sites:	Up to 505,698 sites (Table 1-2).			
Chemical concentration:	Table 1-1 provides concentration ranges (with example chemicals) of typical fuel additives.			
<b>EVALUATION</b>				
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	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 fuel and additive types.
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	U.S. EPA, (2021). Use of additives in plastics converting – Generic scenario for estimating occupational exposures and environmental releases (revised draft).			
<b>HERO ID:</b>	11373493			
<b>Conditions of Use:</b>	Plastics Converting			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Process description:	Compounded resins received, unloaded, forming/molding/shaping, trimming, finishing (including coating operations).			
Throughput:	Provides methodology for estimating throughput based on the amount of plastic produced, and the concentration of the chemical additive in the plastic.			
Number of sites:	Provides methodology for estimating number of sites based on chemical PV, the amount of plastic produced, and the concentration of the chemical additive in the plastic.			
Chemical concentration:	Provides conc. estimates based on additive function in various plastics, not chemical specific.			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data.	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic and additive types.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	U.S. EPA, (2024). Emission Scenario Document on fluorocarbon substitutes in blowing agents for manufacture of rigid and flexible foam (draft).			
<b>HERO ID:</b>	12197147			
<b>Conditions of Use:</b>	Manufacture of Polyurethane Foam for Pipeline Pigs			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Process description:	Typical polyurethane foam manufacturing site receive liquid DIBP in small containers ranging from 5 to 20 gallons or in drums ranging from 20 to 100 gallons (p. 4-8).			
<b>EVALUATION</b>				
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 published by EPA, so it is US-based.
	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	ESD is from 2024, less than 10 years old.
	Metric 5:	Sample Size	Medium	Container size is characterized by a range.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability is addressed by providing a range of container sizes. Uncertainty isn’t addressed.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	U.S. EPA, (2014). Generic scenario draft on the use of additives in plastic compounding.		
<b>HERO ID:</b>	3827195		
<b>Conditions of Use:</b>	Plastics Compounding		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Process description:	Polymer pellets/resins received, blending/compounding into masterbatch, extrusion/shaping, packaging.		
Throughput:	Provides methodology for estimating throughput based on the amount of plastic produced, and the concentration of the chemical additive in the plastic. 148-264 days/yr.		
Number of sites:	Provides methodology for estimating number of sites based on chemical PV, the amount of plastic produced, and the concentration of the chemical additive in the plastic.		
Chemical concentration:	Provides conc. estimates based on additive function in various plastics, not chemical specific.		
<b>EVALUATION</b>			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic and additive types.
<b>Overall Quality Determination</b>		<b>High</b>	



<b>Study Citation:</b>	U.S. EPA, (2014). Formulation of waterborne coatings - Generic scenario for estimating occupational exposures and environmental releases -Draft.			
<b>HERO ID:</b>	3827197			
<b>Conditions of Use:</b>	Formulation of Coatings			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	1.6-16 million kg coatings/site-yr			
Process description:	Unloading solid/liquid components from tank cars, totes, drums, or sacks and from filter replacement → pre-mixer (pigment dispersion), grinder (pigment dispersion), blending tank, filter, packaging.			
Throughput:	Provides methodology for estimating throughput based on the amount of coatings produced, and the concentration of the chemical in the coating.			
Chemical concentration:	Provides conc. estimates based on chemical function and coating type, not chemical specific.			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data.	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple coating applications, and multiple chemical functions.	
<b>Overall Quality Determination</b>		<b>High</b>		

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

<b>Study Citation:</b>	U.S. EPA, (2004). Additives in plastics processing (compounding) – generic scenario for estimating occupational exposures and environmental release – Draft.
<b>HERO ID:</b>	6311218
<b>Conditions of Use:</b>	incorporation into article as a plasticizer in plastic product manufacturing; incorporation into formulation, mixture, or reaction product as a plasticizer in plastic product manufacturing

EXTRACTION	
Parameter	Data
Production, import, or use volume:	provides the North American Production (lb/yr) of the types of Thermoplastics from 2003 -p. 3
Process description:	Polymer pellets/resins received, blending/compounding into masterbatch, extrusion/shaping, packaging
Throughput:	'Provides methodology for estimating throughput based on the amount of plastic produced, and the concentration of the chemical additive in the plastic
Number of sites:	'Provides methodology for estimating number of sites based on chemical PV, the amount of plastic produced, and the concentration of the chemical additive in the plastic
Chemical concentration:	'Provides conc. estimates based on additive function in various plastics, not chemical specific
Comments:	QC Note: This is an early draft of the Plastic Compounding GS and may not provide the most up to data info

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

<b>Overall Quality Determination</b>	<b>High</b>
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<b>Study Citation:</b>	U.S. EPA, (2001). Manufacture and use of printing ink - Generic scenario for estimating occupational exposures and environmental releases (revised draft).		
<b>HERO ID:</b>	6311221		
<b>Conditions of Use:</b>	Formulation and Use of Printing Inks		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	11.9-373.8 million kg ink/yr (depending on printing application), total is 794.3 million kg total ink/yr		
Process description:	PROC: Vehicle consisting of resin, solvent, drying agents, and resn plasticizing oils is prepared, pigment blended into vehicle, fed to dispersing mill, raw ink let down with additional solvent and other additives, packaged for sale.USE: Provides descriptions for lithography, gravure, flexography, letterpress, digital priting, and screen printing.		
Throughput:	Provides methodology for estimating throughput based on the amount of ink produced, and the concentration of the chemical in the ink for both PROC and USE		
Number of sites:	PROC: 13-239 (depending on printing application)USE: 454-18,622 (depending on printing application)		
Chemical concentration:	Provides conc. estimates based on chemical function, not chemical specific.		
<b>EVALUATION</b>			
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 printing applications, and multiple chemical functions
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	U.S. EPA, (1999). Flexographic printing - generic scenario for estimating occupational exposures and environmental releases: Draft.			
<b>HERO ID:</b>	6385709			
<b>Conditions of Use:</b>	Flexographic Printing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Process description:	ink received in drums, charged to ink chamber, flexographic 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.			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	U.S. EPA, (2010). Manufacture and use of printing inks - generic scenario for estimating occupational exposures and environmental releases: Draft.			
<b>HERO ID:</b>	6385710			
<b>Conditions of Use:</b>	Formulation and Use of Printing Inks			
EXTRACTION				
Parameter	Data			
Life cycle description:	It was estimated that approximately 97% of all industrial end use printing activities can be categorized within five different printing processes: lithography, flexography, gravure, letterpress and screen printing			
Process description:	PROC: Vehicle consisting of resin, solvent, drying agents, and resn plasticizing oils is prepared, pigment blended into vehicle, fed to dispersing mill, raw ink let down with additional solvent and other additives, packaged for sale.USE: Provides descriptions for lithography, gravure, flexography, letterpress, digital priting, and screen printing.			
Number of sites:	See Table 2-2: A total of 4,221 sites from 2007 data			
Chemical concentration:	Of the reviewed 15 chemicals, 8 chemicals were manufactured or imported in 100% concentration; 7 chemicals were manufactured or imported in concentrations < 100%.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Medium	The GS is more than 10 years but no more 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	Uncertainty not addressed. Variability not addressed.	
Overall Quality Determination		Medium		

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

<b>Study Citation:</b>	U.S. EPA, (2004). Spray coatings in the furniture industry - generic scenario for estimating occupational exposures and environmental releases: Draft.			
<b>HERO ID:</b>	6385719			
<b>Conditions of Use:</b>	Furniture Coating Application			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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.			
<b>EVALUATION</b>				
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.
<b>Overall Quality Determination</b>		<b>Medium</b>		



<b>Study Citation:</b>	U.S. EPA, (1994). Fabric finishing - generic scenario for estimating occupational exposures and environmental releases: Draft.		
<b>HERO ID:</b>	6385741		
<b>Conditions of Use:</b>	Processing: Fabric, textile, and leather products		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	73 million kg finishing agents/yr		
Process description:	Fabric immersed in an aqueous finishing formulation then squeezed between metal rolls to remove excess padding solution and to aid in the even distribution of the finishing agent, fabric dried by passing over a series of heated metal rolls, fabric cured by passing through a long oven.		
Throughput:	3,520-50,000 kg cloth/site-day		
Number of sites:	1,100 total finishing plants		
Chemical concentration:	Provides conc. estimates based on chemical function, not chemical specific.		
<b>EVALUATION</b>			
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 finishing agent types
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	U.S. EPA, (2014). Use of additive in plastic compounding - generic scenario for estimating occupational exposures and environmental releases: Draft.			
<b>HERO ID:</b>	6385748			
<b>Conditions of Use:</b>	Processing - Additive in Plastic Compounding			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Life cycle description:	Plastics Compounding			
Process description:	Polymer pellets/resins received, blending/compounding into masterbatch, extrusion/shaping, packaging			
Throughput:	Op days: 148-264 days/yr. Provides methodology for estimating throughput based on the amount of plastic produced, and the concentration of the chemical additive in the plastic			
Number of sites:	Provides methodology for estimating number of sites based on chemical PV, the amount of plastic produced, and the concentration of the chemical additive in the plastic			
Chemical concentration:	Provides conc. estimates based on additive function in various plastics, not chemical specific.			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	This GS is based on U.S. data	
	Metric 3: Applicability	Medium	Data is for an in-scope occupational scenario; however, data is general and not specific to a chemical.	
	Metric 4: Temporal Representativeness	Medium	Assessment is generally based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple plastic and additive types.	
<b>Overall Quality Determination</b>		<b>High</b>		

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

**EXTRACTION**

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

**EVALUATION**

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

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

<b>Study Citation:</b>	U.S. EPA, (1992). Generic scenario document for lube oil additives.			
<b>HERO ID:</b>	8726954			
<b>Conditions of Use:</b>	Manufacture			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	1,000,000 kg additive/year			
Process description:	The nature of the production process varies among additives. PMN produced at 100% concentration then diluted to between 90 - 50%in mineral oil to facilitate handling. More detailed description on page 8			
Number of sites:	2			
Chemical concentration:	PMN produced at 100% concentration then diluted to between 90 - 50%in mineral oil			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data from frequently-used source (EPA).
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(Fuels and Related Products); 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 a range for concentration but not characterized for PV estimate.
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	Uncertainty not addressed. Variability addressed by considering multiple additive types.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	U.S. EPA, (1992). Generic scenario document for lube oil additives.			
<b>HERO ID:</b>	8726954			
<b>Conditions of Use:</b>	Use as a fuel additive			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	29.3 MM gal/yr lube			
Process description:	Workers drain out oil from automobiles and add fresh oil containing 1% fuel additive. Used oil is collected and recycled			
Number of sites:	Pure lube: 4,000 sites, 20,000 workersGeneral Automotive: 57,629 sites, 222,720 workers			
Chemical concentration:	Conc.: 1% additive in lube oil product			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	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	Report is based on data greater than 20 years old (1992) and industry conditions that are expected to be outdated.
	Metric 5:	Sample Size	Medium	Data characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented. Exhibit 2 contains source for PV while ref 14 and 15 are specified for other extracted data.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple additive types.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	3M, (2019). 3M™ Finesse-It Polish - Finishing Material, 13084, 28792, 81235, 83058.			
<b>HERO ID:</b>	6311436			
<b>Conditions of Use:</b>	Application of Paints and Coatings			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	Product contains less than the maximum concentration value (0.1%) of phthalates.			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Regulatory data sheet contains primary information from the manufacturer and does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	Regulatory data sheet is applicable to an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Source is from 2020, which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	ACA, (2019). Comment submitted by Raleigh Davis, Assistant Director and Riaz Zaman, Counsel, Government Affairs, American Coatings Association (ACA) regarding the proposed 20 high priority candidates for chemical risk evaluation.			
<b>HERO ID:</b>	10369850			
<b>Conditions of Use:</b>	Adhesives			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Life cycle description:	Additive and impurity in adhesives			
Chemical concentration:	The chemical is present as an additive and impurity in adhesives in amounts less then 0.1%.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	Low	The data and data sources used to determine the concentration of DIBP as an impurity in adhesives are not provided.	
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 not characterized.	
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		



<b>Study Citation:</b>		AKPA, (2017). Safety Data Sheet (SDS): AKPEROX BP 50 PASTE.		
<b>HERO ID:</b>		6302650		
<b>Conditions of Use:</b>		Application of adhesives and sealants		
<b>EXTRACTION</b>				
<b>Parameter</b>		<b>Data</b>		
Chemical concentration:		1-5%		
<b>EVALUATION</b>				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	From an OECD country (Turkiye)
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (adhesives and sealants)
	Metric 4:	Temporal Representativeness	High	Source is from 2017, which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Akzo Nobel Polymer Chemicals (2008). Butanox LPT.			
<b>HERO ID:</b>	6302635			
<b>Conditions of Use:</b>	Adhesives and Sealants			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Process description:	Butanox LPT is a methyl ethyl ketone peroxide (MEKP) for the curing of unsaturated polyester resins in the presence of a cobalt accelerator at room and elevated temperatures.Document also gives dosing information and gel/cure times on PDF Pg. 3-4			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for adhesives and sealants, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	N/A	N/A - Process description.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - Process description.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	APR, (2023). Model Bale Specifications: 1-7 ALL Rigid Plastics.			
<b>HERO ID:</b>	11374516			
<b>Conditions of Use:</b>	Recycling			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Process description:	Plastic recycling bale size is approximately 30"x42"x48" or 30"x48"x60". Bale density is 15-20 lb/ft^3. Bales should be held together with 10-12 gauge, noncorrosive galvanized metal wire, with all bale wires wrapped in one direction (crisscrossing or double strapping should be preapproved by the buyer before shipping). A minimum number of bale wires should be used to maintain bale integrity. The number will vary with bale size and density. Bale integrity must be maintained throughout loading, shipping, unloading and storage. Bales should be stored, with the bottom bale on a pallet, indoors or covered outdoors. Material must not be stored outdoors uncovered for a period exceeding four (4) weeks to prevent UV degradation from direct sunlight and moisture contamination.			
Comments:	Source does not contain production, import, or use volume, throughput, or release or emission factors.			
<b>EVALUATION</b>				
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 is from the U.S.
	Metric 3:	Applicability	High	Data is for recycling, which is an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Data are less than 10 years old (2023).
	Metric 5:	Sample Size	N/A	N/A - Process description.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Assessment results are provided but underlying methods, assumptions, and data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - Process description.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Ashworth, M. J., Chappell, A., Ashmore, E., Fowles, J. (2018). Analysis and assessment of exposure to selected phthalates found in children’s toys in Christchurch, New Zealand. International Journal of Environmental Research and Public Health 15(2):200.		
<b>HERO ID:</b>	4198524		
<b>Conditions of Use:</b>	Consumer use - children’s toys		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Chemical concentration:	49 samples: 42 samples had 0-0.1% DIBP by mass; 5 samples had 0.1-1.0 % DIBP by mass; 1 sample had 1.1-10 % DIBP by mass; 1 sample had 20.1-30 % DIBP by mass. Max conc. (% by mass) was 27.6. Mean conc. (% by mass) was 1.71. Median conc. (% by mass) was 0.040.		
Comments:	Of the 49 toys analyzed, 65% contained at least one phthalate at a concentration of >0.1% by mass; and 35% contained multiple-phthalates at individual concentrations of >0.1%. TDI for DIBP is 100 ug/kg bw/day		
<b>EVALUATION</b>			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Source is peer reviewed so would not indicate flaws or quality issues in the report.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data is for New Zealand, an OECD country.
	Metric 3: Applicability	Uninformative	Source is not for an occupational scenario and likely could not be applied to one.
	Metric 4: Temporal Representativeness	High	Source is less than 10 years old.
	Metric 5: Sample Size	Medium	Characterized by range with uncertain statistics
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Report clearly documents results, methods, and assumptions. Sources generally de-scribed.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Address variability in testing across multiple toys but does not address uncertainty.
<b>Overall Quality Determination</b>		<b>Uninformative</b>	

<b>Study Citation:</b>		AzkoNobel, (2011). Material Safety Data Sheet (MSDS): Perkadox® 40E.			
<b>HERO ID:</b>		6302652			
<b>Conditions of Use:</b>		Application of adhesives and sealants			
		<b>EXTRACTION</b>			
<b>Parameter</b>		<b>Data</b>			
Chemical concentration:		40-45%			
		<b>EVALUATION</b>			
Domain		Metric		Rating	Comments
Domain 1: Reliability		Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness		Metric 2:	Geographic Scope	High	Product is from a US supplier.
		Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (adhesives and sealants)
		Metric 4:	Temporal Representativeness	Medium	More than 10 but less than 20 years old (2011).
		Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity		Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty		Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>		<b>Medium</b>			

<b>Study Citation:</b>	Azon, (2017). Safety Data Sheet (SDS): Azo-Cat 25.			
<b>HERO ID:</b>	11799639			
<b>Conditions of Use:</b>	Use of Adhesives and Sealants			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	>50-<75%			
<b>EVALUATION</b>				
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 use of adhesives and sealants, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Concentrations are reported in a range.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>		Azon, (2015). Safety Data Sheet (SDS): Azo-Cat 24.			
<b>HERO ID:</b>		6302649			
<b>Conditions of Use:</b>		Application of adhesives and sealants			
<b>Parameter</b>		<b>EXTRACTION</b>			
<b>Data</b>					
Chemical concentration:		<60%			
		<b>EVALUATION</b>			
Domain		Metric		Rating	Comments
Domain 1: Reliability		Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness		Metric 2:	Geographic Scope	High	Product is from a US supplier.
		Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (adhesives and sealants)
		Metric 4:	Temporal Representativeness	High	Source is from 2015, which is less than 10 years old.
		Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity		Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty		Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>		<b>High</b>			

<b>Study Citation:</b>	Azon, (2015). Safety Data Sheet (SDS): Azo-Grout 553.			
<b>HERO ID:</b>	6302656			
<b>Conditions of Use:</b>	Application of adhesives and sealants			
		<b>EXTRACTION</b>		
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	<50%			
		<b>EVALUATION</b>		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (adhesives and sealants)
	Metric 4:	Temporal Representativeness	High	Source is from 2015, which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>		<b>High</b>		



<b>Study Citation:</b>		Azon, (2015). Safety Data Sheet (SDS): Azo-Cat™ 48.		
<b>HERO ID:</b>		6302660		
<b>Conditions of Use:</b>		Application of adhesives and sealants		
Parameter		EXTRACTION		
Chemical concentration:		<60%		
Domain		Metric		EVALUATION
				Rating
				Comments
Domain 1: Reliability		Metric 1:	Methodology	High
				SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness		Metric 2:	Geographic Scope	High
		Metric 3:	Applicability	High
		Metric 4:	Temporal Representativeness	High
		Metric 5:	Sample Size	Medium
				Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity		Metric 6:	Metadata Completeness	Low
				Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty		Metric 7:	Metadata Completeness	Medium
				Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>		Azon, (2015). Safety Data Sheet (SDS): Azo-Grout 447.			
<b>HERO ID:</b>		6302667			
<b>Conditions of Use:</b>		Application of adhesives and sealants			
<b>EXTRACTION</b>					
<b>Parameter</b>		<b>Data</b>			
Chemical concentration:		<50%			
<b>EVALUATION</b>					
Domain		Metric		Rating	Comments
Domain 1: Reliability		Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness		Metric 2:	Geographic Scope	High	Product is from a US supplier.
		Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (adhesives and sealants)
		Metric 4:	Temporal Representativeness	High	Source is from 2015, which is less than 10 years old.
		Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity		Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty		Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>			<b>High</b>		

<b>Study Citation:</b>	Azon, (2015). Safety Data Sheet (SDS): Azo-Grout 552.			
<b>HERO ID:</b>	6302676			
<b>Conditions of Use:</b>	Application of adhesives and sealants			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	<50%			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (adhesives and sealants)
	Metric 4:	Temporal Representativeness	High	Source is from 2015, which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Bao, J., Wang, M., Ning, X., Zhou, Y., He, Y., Yang, J., Gao, X., Li, S., Ding, Z., Chen, B. (2015). Phthalate concentrations in personal care products and the cumulative exposure to female adults and infants in Shanghai. Journal of Toxicology and Environmental Health, Part A: Current Issues 78(5):325-341.			
<b>HERO ID:</b>	2816857			
<b>Conditions of Use:</b>	Use of Personal care products			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Process description:	PE are added to PCP as emollients, skin permeability enhancers, and stabilizers for color or fragrance (Parlett et al., 2013).			
Throughput:	Use rates and application frequency of personal care products in Table 1			
Chemical concentration:	Concentration in personal care products compiled in Table 3: ranges from 0 to 393 mg/kg			
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	Low	The data are from a non-OECD country, and locality-specific factors (e.g., potentially greater differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S., or the country of origin is not specified.
	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	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	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	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		Uninformative		

<b>Study Citation:</b>	Bekament, (2019). Safety Data Sheet (SDS): RZ-BLP-112 - BK-NitroEmajl.			
<b>HERO ID:</b>	6302653			
<b>Conditions of Use:</b>	Application of paints and coatings			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	2 – <5%			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	From non-OECD country (Serbia)
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (paints and coatings)
	Metric 4:	Temporal Representativeness	High	Source is from 2019, which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Bononi, M., Tateo, F. (2009). Identification of diisobutyl phthalate (DIBP) suspected as possible contaminant in recycled cellulose for take-away pizza boxes. Packaging Technology and Science 22(1):53-58.			
<b>HERO ID:</b>	1312130			
<b>Conditions of Use:</b>	Adhesives and Sealants			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Life cycle description:	”Due to its similarities to DBP, DIBP can be usedas a substitute for DBP as plasticizer in adhesives,printing inks and coloured laminated films; it isfrequently used as a gelling aid in combinationwith other plasticizers and for polyacetate dispersions” pg. 2/6			
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 Italy, an OECD country
	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
	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 generally more than 10 years but no more than 20 years old.
	Metric 5:	Sample Size	N/A	N/A- sampling data not extracted.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Assessment or report clearly documents its data sources, assessment methods, results, andassumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A- only life cycle description extracted.
Overall Quality Determination		High		

<b>Study Citation:</b>	Cadogan, D., Howick, C. (2000). Plasticizers.			
<b>HERO ID:</b>	6311430			
<b>Conditions of Use:</b>	Use as a plasticizer			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Life cycle description:	Well over 90% of plasticizer sales by volume are into the PVC industry (p. 10). // Worldwide consumption of plasticizers is estimated at $3.5 \times 10^6$ t (31), and is of the order of 1 million tons in Western Europe (Fig. 7; Table 4). The distribution of plasticizers into various applications is as follows: 27%, wire and cable covering; 23%, extrusion/profile; 17%, film and sheet; 13%, coated fabrics; 12%, wall covering; and 8%, undersealing/coating. (p. 20).			
Process description:	The steps involved in the incorporation of a plasticizer into a PVC product can be divided into five distinct stages: (1) Plasticizer is mixed with PVC resin. (2) Plasticizer penetrates and swells the resin particles. (3) Polar groups in the PVC resin are freed from each other. (4) Plasticizer polar groups interact with the polar groups on the resin. (5) The structure of the resin is re-established, with full retention of plasticizer (p. 6).			
Chemical concentration:	Flexible PVC is typically 30wt% plasticizer (Tab 2). 10wt% in acrylic (Sec 4.1). 2wt% in polyolefins (Sec 4.4). Up to 25wt% in fluoroplastics (Sec 4.6).			
<b>EVALUATION</b>				
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. (most data is European).
	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	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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	CBC, (2014). Safety Data Sheet (SDS): Centerfire Pistol & Revolver and Rifle Cartridges.			
<b>HERO ID:</b>	6302648			
<b>Conditions of Use:</b>	Fabrication of final product from articles			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	0.1-0.6%			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	From non-OECD country (Brazil)
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (fabrication into articles)
	Metric 4:	Temporal Representativeness	Medium	More than 10 but less than 20 years old (2014)
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>			<b>Medium</b>	



<b>Study Citation:</b>	CDC, (2009). Fourth national report on human exposure to environmental chemicals.			
<b>HERO ID:</b>	664488			
<b>Conditions of Use:</b>	Manufacturing			
EXTRACTION				
Parameter	Data			
Life cycle description:	Dibutyl phthalates (both di-n-butyl and di-isobutyl phthalates, referred to as DBP) are industrial solvents or additives used in many personal care products such as nail polish and cosmetics, and also in some printing inks, pharmaceutical coatings, and insecticides.			
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	Medium	The report captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. The report is generally more than 10 years but no more than 20 years old.	
	Metric 5: Sample Size	N/A	Information is qualitative	
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		

<b>Study Citation:</b>	CEPE, (2020). SpERC fact sheet: Industrial application of coatings by spraying.			
<b>HERO ID:</b>	10442901			
<b>Conditions of Use:</b>	Paints and Coatings			
EXTRACTION				
Parameter	Data			
Throughput:	Typical maximum daily usage, based on sector knowledge,1000 kg product/day at any one location, further broke down by function (pg. 2/5)Pigment/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 release data are for an occupational scenario that is similar to an occupational scenario 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	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	Variability is addressed by including throughput for different substance functions but uncertainty is not addressed.	
Overall Quality Determination		Medium		

<b>Study Citation:</b>	CEPE, (2020). SpERC fact sheet: Professional application of coatings and inks by spraying.			
<b>HERO ID:</b>	10442902			
<b>Conditions of Use:</b>	Paints and Coatings, Inks, 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 release data are for an occupational scenario that is similar to an occupational scenario 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	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	Variability is addressed by including throughput for different substance functions but uncertainty is not addressed.	
Overall Quality Determination		Medium		

<b>Study Citation:</b>	CertiPrep., SPEX (2016). Safety Data Sheet (SDS): Diisobutyl phthalate in PE.			
<b>HERO ID:</b>	6302671			
<b>Conditions of Use:</b>	Use of laboratory chemicals			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	0.1%			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (lab chems)
	Metric 4:	Temporal Representativeness	High	Source is from 2016, which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	CertiPrep., SPEX (2018). Safety Data Sheet (SDS): Diisobutyl phthalate.			
<b>HERO ID:</b>	6302677			
<b>Conditions of Use:</b>	Use of laboratory chemicals			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	0.1%			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (lab chems)
	Metric 4:	Temporal Representativeness	High	Source is from 2018, which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	CertiPrep., SPEX (2015). Safety Data Sheet (SDS): Phthalic acid diisobutyl ester.			
<b>HERO ID:</b>	6302678			
<b>Conditions of Use:</b>	Use of laboratory chemicals			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	0.1%			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (lab chems)
	Metric 4:	Temporal Representativeness	High	Source is from 2015, which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Chemical Concepts Inc, (2014). Safety Data Sheet (SDS): Chem-Set C-19 Seaming Adhesive – All Colors.			
<b>HERO ID:</b>	6302659			
<b>Conditions of Use:</b>	Application of adhesives and sealants			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	15 – 40%			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (adhesives and sealants)
	Metric 4:	Temporal Representativeness	Medium	More than 10 but less than 20 years old (2014)
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Chemical Specialties Ltd, (2017). Safety Data Sheet (SDS): Polyester Filler Hardener Paste.			
<b>HERO ID:</b>	6302644			
<b>Conditions of Use:</b>	Application of adhesives and sealants			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	0-30%			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	From an OECD country (New Zealand)
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (adhesives and sealants)
	Metric 4:	Temporal Representativeness	High	Source is from 2017, which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>			<b>Medium</b>	



<b>Study Citation:</b>	Christia, C., Poma, G., Harrad, S., Wit, De, C. A., Sjostrom, Y., Leonards, P., Lamoree, M., Covaci, A. (2019). Occurrence of legacy and alternative plasticizers in indoor dust from various EU countries and implications for human exposure via dust ingestion and dermal absorption. Environmental Research 171:204-212.		
<b>HERO ID:</b>	5772597		
<b>Conditions of Use:</b>	consumer use - household		
EXTRACTION			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	Manufacture/import volume of DIBP in Europe was 1000-10,000 tone/yr in 2017		
Number of sites:	33 homes sampled. 18 from Belgium, 6 from Ireland, 9 from Netherlands. 3 daycare centers in Sweden.		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Journal is peer reviewed so likely contains high quality data and exposure comparisons are for EU and EPA.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data is for EU OECD countries: Belgium, Ireland, Sweden, and Netherlands
	Metric 3: Applicability	Uninformative	Report is for gen pop studies for household, daycare and office space phthalate dust.
	Metric 4: Temporal Representativeness	High	Report is from 2019
	Metric 5: Sample Size	Medium	Distribution of samples characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	Addresses variability by sampling across different countries and addresses uncertainty through its description of determining limits of quantitation.
Overall Quality Determination		Uninformative	

<b>Study Citation:</b>	Company Withheld (n.d.). Zeigler Natta catalysts using phthalates (sanitized).				
<b>HERO ID:</b>	11591965				
<b>Conditions of Use:</b>	Use as a Catalyst				
<b>EXTRACTION</b>					
<b>Parameter</b>		<b>Data</b>			
Process description:		Phthalates are known to react with other components in the polymerization process and the small amount that survives is further diluted by the polymer formed. A typical activity of 20,000 grams of polypropylene for every gram of catalyst leads to polymer containing 50 ppm catalyst residues. If the original catalyst contained 10% phthalate this would lead to 5 ppm phthalate in the polymer if all the phthalate survived the polymerization process unscathed. In practice most of the phthalate reacts with the aluminum alkyls to form non-phthalate products.Additional information on Phthalate reaction with Trialkylaluminums during polymerization is given on PDF Pg. 4-6.			
Chemical concentration:		DIBP concentrations in 3 catalysts (by weight) were: 11.5%, 6.24%, and 10.5%			
<b>EVALUATION</b>					
Domain		Metric		Rating	Comments
Domain 1: Reliability		Metric 1:	Methodology	Medium	Report uses high quality data/techniques/methods that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness		Metric 2:	Geographic Scope	High	Data are from the U.S.
		Metric 3:	Applicability	High	Data are for use as a catalyst, which is an in-scope occupational scenario.
		Metric 4:	Temporal Representativeness	Medium	Date of publication is unknown; however, due to the newest citation being from 2005, the article is assumed to be less than 20 years old.
		Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity		Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty		Metric 7:	Metadata Completeness	Medium	Variability addressed by DIBP concentrations for multiple catalysts but uncertainty is not addressed.
<b>Overall Quality Determination</b>				<b>High</b>	

<b>Study Citation:</b>	Cordeiro, C. F., Petrocelli, F. P. (2005). Vinyl acetate polymers.			
<b>HERO ID:</b>	10186827			
<b>Conditions of Use:</b>	Processing: Plasticizers in adhesive manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Life cycle description:	Plasticizers are added to emulsion adhesives to modify several properties of both the emulsion and the finished adhesive film. By softening the polymer particles dispersed in the emulsion and increasing their mobility, plasticizers cause them to flow together more easily. This usually increases the viscosity of the emulsion and tends to destabilize it for faster breaking and setting speeds at the time it is applied. In addition, the increased softness and mobility help the emulsion to wet smooth, nonporous surfaces, eg, films, foils, and coated papers, thereby increasing its adhesion to them. Also, the softened polymer particles coalesce more rapidly and at a lower temperature than is possible with the unplasticized emulsion. This improved coalescence increases the water resistance of the adhesive film. Plasticizers are usually highboiling esters, eg, phthalates.			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	The data are from the United States and are representative of the industry being evaluated.
	Metric 3:	Applicability	Medium	The information is for an occupational scenario within the scope of the risk evaluation but information is general to phthalates and not specific to DIBP.
	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	No sample data.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions. Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A for extracted information.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	CPSC, (2015). Exposure assessment: Composition, production, and use of phthalates.
<b>HERO ID:</b>	5155508
<b>Conditions of Use:</b>	Manufacturing; processing

**EXTRACTION**

Parameter	Data
Production, import, or use volume:	Years 1986, 1990, 1994, and 1998 had Production Ranges (pounds) of >1,000,000 - 10,000,000. 2002 had a Production Range of >500,000 - 1,000,000 and the year 2012 had a Production Range of 500,000. The U.S. EPA (2015) reports that past production volumes were near 453,710 lb/yr by at least one company, but shows at least two companies listed as manufacturing DIBP. The Danish EPA (2011) reported information was available from manufacture and/or use in Europe in the range of 20,000,000–50,000,000 pounds/year (10,000–50,000 tons/year). They present data on EU production and import of DIBP used for production in 2007 at 38,000,000 pounds (19,000 tons) and in 2009/2010 at 6,000,000 pounds (3,000 tons). In Nordic countries, up to 50,706 pounds (23 tonnes) of DIBP was used in 2012. Total DIBP use, however, has shown a mostly decreasing trend since peak usage in 2007 (at 104.9 tonnes or 231,264 pounds). Overall, use has steadily declined in Sweden since 2002, in Finland since 2003, and in Norway and Denmark since 2007.
Life cycle description:	DIBP is produced and processed into children's toys and child care articles, typically combined with other phthalates for use in PVC. DIBP can also be found industrially in paints, lacquers, varnishes, paper, pulp and boards, adhesives, binding agents, "softeners", and viscosity adjusters; in Australia similar uses are reported along with additional use as a catalyst
Process description:	Synthesis of DIBP generally occurs by esterification of phthalic anhydride with i-butyl alcohol (isobutanol) in a closed system, followed by purification using vacuum distillation or activated charcoal.
Number of sites:	In the United States, two manufacturers were reported in 2006 by HSDB (2015). U.S. EPA (2015) shows at least two U.S. companies as manufacturing DIBP. A Chem Sources Online search (2015) identified at least 12 U.S. manufacturers, three Chinese manufacturers, and one each in Switzerland, Germany, Hong Kong, Japan, and the United Kingdom.
Chemical concentration:	Table 10-3 (DIBP conc. in Children's Products). Table 10-4 (DIBP conc. in Consumer Products)

**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 contains US and OECD country data.
	Metric 3: Applicability	High	Data is directly applicable to conditions of use.
	Metric 4: Temporal Representativeness	High	Most recent US reported DIBP production volume is 2012, so less than 10 years old.
	Metric 5: Sample Size	Medium	Sample size characterized by a range with uncertain statistics
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Report clearly documents results, methods, and assumptions. Data sources are generally described.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Data addresses variability by stating information over the years and the sources of production. Does not address uncertainty.

**Overall Quality Determination****High**

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Study Citation:	CPSC, (2015). Exposure assessment: Composition, production, and use of phthalates.		
HERO ID:	5155508		
Conditions of Use:	Manufacturing; processing		
		EVALUATION	
Domain	Metric	Rating	Comments

<b>Study Citation:</b>	CPSC, (2015). Exposure assessment: Potential for the presence of phthalates in selected plastics.			
<b>HERO ID:</b>	5155510			
<b>Conditions of Use:</b>	Processing - plasticizer			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Process description:	Several additives may be blended with PP polymer, but phthalates are not used as additives. However, Ziegler-Natta catalysts are used in the production of PP. These catalysts are prepared using magnesium- and titanium (IV) chloride, and an internal donor, which is very often a phthalate like dibutyl phthalate (DBP), diisobutyl phthalate (DIBP) or bis(2-ethylhexyl) phthalate (DEHP) (Borealis, 2014). These catalysts may survive the polymerization process and the phthalates may theoretically be present in concentrations of about 1 mg/kg in the final pellets. However, based on test results, the phthalate values do not exceed 0.15 mg/kg PP (0.15 ppm, or 0.00001 weight %), and they are often below the threshold of the analytical method of 0.01 mg/kg PP (or 0.000001 weight %); both values are significantly below the regulated level of 0.1% for these phthalates. 3 methods of PP production 1. Slurry Polymerization (also called solvent polymerization)- the common manufacturing process when PP production started, involves carrying out the polymerization in an inert hydrocarbon solvent such as hexane or heptane, which eliminates catalyst activity. 2. Bulk polymerization (or mass polymerization) - the common manufacturing process that followed the slurry polymerization process, unlike slurry polymerization, does not need the use of hexane or heptane solvents. Instead, it uses higher pressure and liquefied propylene as the diluent for the slurry. It eliminates unwanted products of the polymerization reaction. 3. Gas phase polymerization process- the primary current process used in which the propylene and solid catalyst (such as Ziegler-Natta catalysts) are contacted together and then polymerization takes place in either the fluidized-bed reactor or the stirred bed process at the higher pressure as used in bulk polymerization. This process is a more convenient process in production of homopolymer and copolymer and is the most common process used in modern plants among the several processes in polypropylene production. Some additives may be blended into PE polymer during manufacturing and/or during processing into finished parts. According to Bhunia et al. (2013) and Wypych (2012), DIBP, DPP and DBOP (three of the eleven specified phthalates) may be used as additives in the manufacturing or processing of PE. These include fillers, pigments, flame retardants, slip agents, blowing agents, cross-linking agents, antioxidants, carbon black, and antistatic additives.			
Chemical concentration:	Used as Ziegler-Natta catalyst, and concentration is likely less than 0.0001% in Polypropylene and Polyethylene.			
Comments:	PP - polypropylene; PE - polyethylene			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report appears to use high quality data, some from frequently used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data is for US.
	Metric 3:	Applicability	High	Report is for an occupational scenario of manufacturing and processing.
	Metric 4:	Temporal Representativeness	High	Report is less than 10 years old.
	Metric 5:	Sample Size	Low	Data is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Report documents results, methods and assumptions. Sources generally described.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Addresses variability across different manufacturing processes and testing across different plastic materials but does not address uncertainty.
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Study Citation:	CPSC, (2015). Exposure assessment: Potential for the presence of phthalates in selected plastics.		
HERO ID:	5155510		
Conditions of Use:	Processing - plasticizer		
Domain	Metric	EVALUATION Rating	Comments
Overall Quality Determination		High	

<b>Study Citation:</b>	DJECO (2018). Safety data sheet: Glitter Boards.			
<b>HERO ID:</b>	6302640			
<b>Conditions of Use:</b>	Fabrication of final product from articles			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	DIBP was below the limit of detection in various glitter-containing products. It was, however, detected in the coating used for a handle of a brush (0.016%).			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data/techniques/methods from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for fabrication of final products from articles. , an in-scope occupational sce- nario.	
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by testing multiple products but uncertainty is not addressed.	
<b>Overall Quality Determination</b>		<b>High</b>		



<b>Study Citation:</b>	DJECO, (2018). Material Safety Data Sheet (MSDS): Painting - Oh, It’s Magic.			
<b>HERO ID:</b>	6302642			
<b>Conditions of Use:</b>	Application of paints and coatings			
EXTRACTION				
Parameter		Data		
Chemical concentration:		Unknown		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	SDS information is primary data from the supplier; however, it appears to have quality issues (test report, doesn’t include typical SDS sections).
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	From an OECD country (France)
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (paints and coatings)
	Metric 4:	Temporal Representativeness	High	Source is from 2018, which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

<b>Study Citation:</b>	DOE,, WA (2020). Priority consumer products report to the Legislature: Safer products for Washington implementation phase 2.		
<b>HERO ID:</b>	10454465		
<b>Conditions of Use:</b>	Floor coverings		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	Recent national estimates of the sales of resilient flooring, a category of flooring comprised largely of types of vinyl flooring, range from \$3.68 billion in 2016 (Floor Covering Weekly, 2017) to \$4.5 billion in 2019 (Resilient Floor Covering Institute, 2019),the lower amount corresponding to 4.27 billion square feet. (pg. 93/199)		
Life cycle description:	Phthalates are used in vinyl flooring, also known as polyvinyl chloride (PVC) flooring, to soften plastic and increase flexibility and durability.		
Chemical concentration:	Vinyl flooring may contain phthalates at concentrations ranging from 9 – 32% by weight. In 2014, a study of 16 types of vinyl flooring found concentrations of phthalates ranging from 9 – 23% of the flooring by weight (Liang & Xu, 2014).		
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	Medium	The report is for an occupational scenario within the scope of the risk evaluation but data is not chemical specific.
	Metric 4: Temporal Representativeness	High	The report is generally no more than 10 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	Variability is addressed by including concentrations from different literature sources but uncertainty is not addressed.
Overall Quality Determination		High	

<b>Study Citation:</b>	EC/HC, (2017). Draft screening assessment: Phthalate substance grouping.			
<b>HERO ID:</b>	5353181			
<b>Conditions of Use:</b>	Domestic Manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	Manufacture and import quantities for the BBP, DBP, DCHP, and DIBP were in the range of 10,000 to 1,000,000 kg/year. (4/228)”			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Canada, an OECD country.
	Metric 3:	Applicability	High	Data are for domestic manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (ranges) 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 in estimation method of total production data. Variability is addressed by compiling different studies in the report.
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	ECHA, (2017). Opinion on an Annex XV dossier proposing restrictions on four phthalates (DEHP, BBP, DBP, DIBP).			
<b>HERO ID:</b>	10112937			
<b>Conditions of Use:</b>	Incorporation into article			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	Table 2, pg. 14/65, contains PV info for 2014 and future projections for "Tonnes of DEHP, DBP, DIBP and BBP contained in articles in scope placed on the EU28 market"			
Comments:	The report is for articles that may contain certain phthalates in the EU that could contribute to exposures in non occupational environments			
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/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	High	The data is only production volume, which may be useful for occupational scenarios 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	N/A	Data includes only PV info for four phthalates
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		

<b>Study Citation:</b>	ECHA, (2012). Committee for Risk Assessment (RAC) Committee for Socio-economic Analysis (SEAC): Background document to the Opinion on the Annex XV dossier proposing restrictions on four phthalates: Annexes.		
<b>HERO ID:</b>	7325405		
<b>Conditions of Use:</b>	manufacturing		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	Historical production in EU28 are provided in the article. In 2013, production – 89,615 tonnes (DEHP, DBP, and DIBP combined).		
Life cycle description:	DIBP is used as a plasticiser for PVC, as well as a solvent and a fixative in paint, printing inks and adhesives.		
Chemical concentration:	DIBP is not restricted in toys and but its concentration is limited to 5% under the Toy Safety Directive, i.e., Directive 2009/48/EC of the European Parliament and of the Council of 18 June 2009 on the safety of toys. Available data indicates that 1-3% of toys with flexible PVC contain DIBP. It seems likely that the average concentration of DIBP in the DIBP-containing articles is in the range 10-20%, i.e., about half of the average concentration of plasticisers in PVC of approximately 30%. On this basis, it is roughly estimated that DIBP represents 0.5-1.5% of the plasticisers used in toys or 50-300 tonnes.		
<b>EVALUATION</b>			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	report uses high quality data
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	The data are from an OECD country other than the U.S
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5: Sample Size	N/A	Facility/process data
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Report clearly documents its data sources
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Report provides only limited discussion of the variability and uncertainty in the results.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	ECHA, (2010). Background document for diisobutyl phthalate (DIBP): Document developed in the context of ECHA's second Recommendation for the inclusion of substances in Annex XIV.
<b>HERO ID:</b>	8435433
<b>Conditions of Use:</b>	Manufacturing and lifecycle

**EXTRACTION**

Parameter	Data
Production, import, or use volume:	The world wide production of both DBP (dibutyl phthalate) and DIBP was estimated by a consultant as being 450,000 t/y (cited in Annex XV, 2009). In an authorised IUCLID data sheet from 2000 (Annex XV, 2009) the quantity of DIBP manufactured and/or used in Europe is indicated in the range of 10,000 to 50,000 t/y (p. 1).
Life cycle description:	DIBP is used as a specialist plasticiser and frequently as a gelling aid in combination with other plasticisers and as plasticiser for nitrocellulose, cellulose ether and polyacrylate and polyacetate dispersions. These are used in paints, lacquers, varnishes, paper, pulp and boards, as adhesives, binding agents, softeners and viscosity adjusters (Annex XV, 2009; RCOM, 2009). DIBP is also used in coatings, e.g. antislip coatings, and in epoxy repair mortars (RCOM, 2009). As a plasticiser in dispersion glues and printing inks DIBP is applied in paper and packaging for food (e.g. rice, baking mixtures, cheese, bread, nuts) and bottled water (Annex XV, 2009). Due to similar application properties it may be used as a substitute for dibutyl phthalate (DBP) (Annex XV, 2009). DIBP has been detected in many consumer products frequently used by children like crayons, bar ends of run bikes, erasers and school bags. In a Chinese study DIBP has been identified in consumer products such as suckers, plastic spoons and forks, boxes for microwave ovens, milk package bags, disposable cups, plates and bowls. DIBP was found in 20/36 perfumes with concentrations ranging from 0.2 - 38 mg/kg (Annex XV, 2009) (p. 2).
Number of sites:	Companies in Austria, Germany, Italy, Spain and UK were known to manufacture or import DIBP in 2000 (Annex XV, 2009). At present it seems that there is at least one European producer of DIBP but no further information regarding the volume is available (RCOM, 2009). There is no further information regarding the formulation and processing sites of DIBP. Presuming a situation similar to that of DBP it can be assumed that formulation and processing take place at about 50-100 major sites, and at an unknown number of smaller installations (ECHA, 2009). (p. 2).

**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 the European Chemicals Agency, which is comprised of OECD countries.
	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 from 2010, which is greater than 10 years old but less than 20 years old.
	Metric 5: Sample Size	Medium	Number of sites and production volume provided as a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.

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Study Citation:	ECHA, (2010). Background document for diisobutyl phthalate (DIBP): Document developed in the context of ECHA's second Recommendation for the inclusion of substances in Annex XIV.		
HERO ID:	8435433		
Conditions of Use:	Manufacturing and lifecycle		
Domain	Metric	EVALUATION Rating	Comments
Overall Quality Determination		Medium	

<b>Study Citation:</b>	ENF, (2024). Plastic recycling plants in the United States.			
<b>HERO ID:</b>	11360395			
<b>Conditions of Use:</b>	Recycling			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Number of sites:	59 plants in the U.S. recycle plastics into various forms, including granules/pellets and flakes. The document lists all plants along with hyperlinks to their address and other metadata.			
<b>EVALUATION</b>				
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 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.	
	Metric 5: Sample Size	N/A	N/A - number of sites.	
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 - number of sites.	
<b>Overall Quality Determination</b>		<b>High</b>		



<b>Study Citation:</b>	ERG, (1998). Air emissions inventories, volume 2: Point sources: Chapter 11: Preferred and alternative methods for estimating air emissions from plastic products manufacturing.
<b>HERO ID:</b>	7349020
<b>Conditions of Use:</b>	Plastics Product Manufacturing

EXTRACTION	
Parameter	Data
Production, import, or use volume:	1995 volume (in millions of pounds) of plastic types is provided in Table 11.2-1: 25,097 mil lbs of polyethylene, 10,890 mil lbs of polypropylene, 5,656 mil lbs of polystyrene, 12,295 mil lbs of PVC, 3,785 mil lbs of saturated polyester, 632 mil lbs of epoxy, 3,204 mil lbs of phenolic, 4,269 mil lbs of polyurethanes, 1,577 mil lbs of unsaturated polyester, and 1,816 mil lbs of urea-formaldehyde.
Process description:	Plastic products manufacturing involves molding, forming, shaping, or otherwise altering plastic resins or plastic materials to produce an intermediate or final product. Solid and foamed plastic products are manufactured using plastic resins or solid plastic chips as the starting material. Most plastic products are manufactured by mixing plastic resins with additives, applying heat or pressure to the mixture, and shaping the mixture to form the desired product. (Section 2.1). // Section 2.1.1 describes the different types of plastics used by plastic products manufacturing facilities in the United States. // 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 (Section 2.1.2). // Plasticizers are added to plastic materials to improve flexibility, workability, or extrudability. Most plasticizers are used in the manufacture of flexible polyvinyl chloride (PVC). Phthalates, adipates, and trimellitates are the most common plasticizers. (Section 2.1.3)

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	Medium	The report is for an occupational scenario within the scope of the risk evaluation; however, information is general and not chemical-specific.
	Metric 4:	Temporal Representativeness	Low	The report is from 1998, which is more than 20 years old.
	Metric 5:	Sample Size	Medium	Volumes are provided as discrete values, but the statistical representativeness and number of samples is unknown.
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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<b>Study Citation:</b>	ERG, (1998). Air emissions inventories, volume 2: Point sources: Chapter 11: Preferred and alternative methods for estimating air emissions from plastic products manufacturing.			
<b>HERO ID:</b>	7349020			
<b>Conditions of Use:</b>	Plastics Product Manufacturing			
Domain		Metric	<b>EVALUATION</b>	
			Rating	Comments
	Metric 7:	Metadata Completeness	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	ESIG, (2020). SPERC Factsheet – Use in rubber production and processing.			
<b>HERO ID:</b>	11360390			
<b>Conditions of Use:</b>	Rubber Manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Process description:	Manufacture of tires and general rubber articles, including processing of raw (uncured) rubber, handling and mixing of rubber additives, vulcanising, cooling and finishing.			
Throughput:	100,000 kg/day			
<b>EVALUATION</b>				
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 Europe.
	Metric 3:	Applicability	High	Data are for rubber manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Low	Sample distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	ESIG, (2012). SPERC fact sheet – Manufacture of substance – Industrial (Solvent-borne).			
<b>HERO ID:</b>	11373487			
<b>Conditions of Use:</b>	Manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	” Production rate assumed to be 2000000 kg/d”			
Process description:	Process Categories: 1 (use in closed process, no likelihood of exposure), 2 (use in closed, continuous process with occasional controlled exposure), 3 (use in closed batch process (synthesis or formulation)), 4 (use in batch and other process (synthesis) where opportunity for exposure arises), 8a (transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities), 8b (transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities), 15 (use as laboratory reagent).			
Throughput:	”The substance maximum use rate (MSPERC) is assumed to be 2000000 kg/d”			
<b>EVALUATION</b>				
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 Europe.	
	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 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.	
	Metric 5: Sample Size	Low	Sample distribution is characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.	
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	FCW, (2017). Statistical Report 2016.			
<b>HERO ID:</b>	10472414			
<b>Conditions of Use:</b>	Floor coverings			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	U.S. floor covering market sales volume (Chart 2)TOTAL: 21.82 BILLION SQUARE FEETCarpet & area rugs 11.52 billionCeramic floor & wall tile 3.00 billionVinyl sheet & floor tile 2.51 billionHardwood flooring 1.69 billionLuxury Vinyl Tile (LVT) 1.50 billionLaminate flooring 1.01 billionStone flooring 324 millionOther resilient 273 million			
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.	
	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 but information is not chemical-specific.	
	Metric 4: Temporal Representativeness	High	The report is generally no more than 10 years old.	
	Metric 5: Sample Size	Low	Distribution of samples is qualitative or characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Assessment or report provides results, but the underlying methods, data sources, and assumptions are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability is addressed by including different floor coverings but uncertainty is not addressed.	
Overall Quality Determination		Medium		

Study Citation:	Fujii, M., Shinohara, N., Lim, A., Otake, T., Kumagai, K., Yanagisawa, Y. (2003). A study on emission of phthalate esters from plastic materials using a passive flux sampler. Atmospheric Environment 37(39-40):5495-5504.		
HERO ID:	1322091		
Conditions of Use:	commercial use - synthetic leathers, flooring, and wallpaper		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	Phthalate esters are contained in many indoor plastic materials: wall papers (30-40%), floor lacquers (20-40%), tiles (5.0-15%), wire coatings (30-50%), and synthetic leathers (60-80%). About 640,000 tons of phthalates were produced in the US in 1994 while in Japan 369,000 tons were produced in 2001.		
Chemical concentration:	DIBP flux rates varies by temperature and flux sampler length. Sample temps were 20, 50, and 80 C with 2.0mm and 0.5 mm samplers. For synthetic leather, flux (ug/h/m^2) was 0.16, 4.7, 24, 1.1, 13, 28 respectively. Second synthetic leather sample ND. Third sample ND. Fourth sample was 0.060, 0.13, 0.45, 0.20, 0.48 and 0.89. For the first wallpaper sample the fluxes were 0.12, 0.42, 0.77, 0.20, 0.64, and 0.86. For the second wallpaper sample it was ND, 1.3, 7.6, 0.29, 1.4, and 7.0. Third sample was 0.06, 0.58, 1.4, 0.14, 0.56, and 2.4. The fourth sample had all ND. For the first, second and third vinyl flooring sample all had ND. The fourth sample had flux rates of 0.06, 0.26, 0.45, 0.091, 0.35, 0.57.		
Comments:	Activation energy of emission for DIBP measured had min: 21 kJ/mol; max: 72 kJ/mol; and mean: 37 kJ/mol		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Report uses high quality data and techniques that are detailed extensively. Does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Report conducted in Japan, an OECD country.
	Metric 3: Applicability	Low	Source is a lab study to detect phthalate emission rates from floorings, leathers, and wallpapers. Source itself is not applicable to a specific occupational scenario but data could be applied to determine emission rates
	Metric 4: Temporal Representativeness	Medium	Report is greater than 10 years old
	Metric 5: Sample Size	High	Individual samples are provided.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Report clearly documents results, methods, and assumptions. Sources generally de-scribed
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Addresses variability by testing across different flux sampler lengths and temperatures. Does not address uncertainty.
Overall Quality Determination		Medium	

<b>Study Citation:</b>	Gaspar, F. W., Castorina, R., Maddalena, R. L., Nishioka, M. G., Mckone, T. E., Bradman, A. (2014). Phthalate exposure and risk assessment in California child care facilities. Environmental Science & Technology 48(13):7593-7601.			
<b>HERO ID:</b>	2345959			
<b>Conditions of Use:</b>	commercial use			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	DIBP is one of the dominant phthaltes present in indoor air with a median concentration of 0.10 ug/m3			
<b>EVALUATION</b>				
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
	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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Giuliani, A., Zuccarini, M., Cichelli, A., Khan, H., Reale, M. (2020). Critical Review on the Presence of Phthalates in Food and Evidence of Their Biological Impact. International Journal of Environmental Research and Public Health 17(16):1-43.			
<b>HERO ID:</b>	8338316			
<b>Conditions of Use:</b>	Other (FDA Products)			
EXTRACTION				
Parameter	Data			
Chemical concentration:	pg. 16-28 provides concentration data of phthalates in beverages and other food products.			
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	Primary authors are from Italy - an OECD country.
	Metric 3:	Applicability	Uninformative	Non-occupational data that is outside of the scope of the risk evaluation (FDA)
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	Medium	uncertain statistics
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	Medium	Variability is addressed by reviewing a range of products and a limited discussion on uncertainty was provided.
Overall Quality Determination		Uninformative		



<b>Study Citation:</b>	Giuliani, A., Zuccarini, M., Cichelli, A., Khan, H., Reale, M. (2020). Critical Review on the Presence of Phthalates in Food and Evidence of Their Biological Impact. International Journal of Environmental Research and Public Health 17(16):1-43.			
<b>HERO ID:</b>	8338316			
<b>Conditions of Use:</b>	Processing: Plastic material and resin manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Process description:	They are manufactured by a reaction of phthalic anydride with various alcohols starting frommethanol and ethanol for the smaller compounds, up to iso-decanol straight chain or with somebranching (pg. 4)			
Chemical concentration:	In fact, epoxy resins revealed high level of DBP (0.08%) and DIBP (0.002%).			
<b>EVALUATION</b>				
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	Primary authors are from Italy - an 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	Medium	Concentration data is characterized by uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents its assessment methods, results, and assumptions but data sources for extracted data(i.e., exists in gas phase) are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	No scope to address variability and uncertainty.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Giulivo, M., Alda, L.d., M., Capri, E., Barceló, D. (2016). Human exposure to endocrine disrupting compounds: Their role in reproductive systems, metabolic syndrome and breast cancer. A review. Environmental Research 151:251-264.			
<b>HERO ID:</b>	3469349			
<b>Conditions of Use:</b>	Manufacturing			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	In 2010, the global production of phthalates was estimated at 4.9 million tons, which accounts for 84% of the total plasticizer production.			
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., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	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. year 2016
	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	Medium	The report provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination			High	

<b>Study Citation:</b>	Gkrillas, A., Dirven, H., Papadopoulou, E., Andreassen, M., Hjertholm, H., Husøy, T. (2021). Exposure estimates of phthalates and DINCH from foods and personal care products in comparison with biomonitoring data in 24-hour urine from the Norwegian EuroMix biomonitoring study. Environment International 155(Elsevier):106598.			
<b>HERO ID:</b>	7978731			
<b>Conditions of Use:</b>	Plasticizers			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	The Organization for Economic Co-operation and Development (OECD) reported in 2018 that global production volumes of phthalate plasticizers could reach approximately 5.5 million metric tonnes per year. (2/13)			
Chemical concentration:	Uses of DBP, DEHP and DiBP were regulated so as not to exceed concentrations equal or greater than 0.1% by weight of plasticized material, individually or in combination in the EU market after July 2020. (2/13)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Norway, an OECD country.
	Metric 3:	Applicability	High	Data are for plasticizers in plastic and resin manufacturing, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	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	High	Uncertainty is addressed in sampling/analytical methodology. Variability is addressed by comparing results to other studies done.
Overall Quality Determination		High		

<b>Study Citation:</b>	Grace, (2022). Di-isobutyl phthalate (DIBP) use (sanitized).			
<b>HERO ID:</b>	11589992			
<b>Conditions of Use:</b>	Incorporation into formulation, mixture, or reaction product			
EXTRACTION				
Parameter	Data			
Process description:	PDF Pg. 2-3”Once DIBP is transferred to the holding vessel, it remains in a closed system. There are no further opportunities for worker exposure after the DIBP is transferred to the holding vessel.This includes the incorporation of DIBP into the pre-catalyst formulation (step D). The commercialized pre-catalyst formulation product that contains DIBP is produced in batches (average final product volume of [REDACTED] each) and packaged in sealed drums under a nitrogen blanket; the formulated mixture product is sensitive to moisture and air (step E). These precatalyst mixtures are sealed in 55 gallon drums equipped with 3 connections: 1. Pressure gauge to verify system integrity2. Filling and unloading3. Nitrogen.The commercialized pre-catalyst formulation products are organometallic complex mixtures. DIBP comprises of up to - of the final formulation. In order to achieve this amount of complexation, excess DIBP needs to be used. Therefore, DIPB leaves Grace sites in two ways; as a part of a product mixture or in a waste stream (step H).”			
Chemical concentration:	DIBP is purchased from two suppliers with similar specifications of 99% purity at a minimum.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data/techniques/methods that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for incorporation into formulation, mixture, and reaction product, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	N/A	DIBP concentration distribution is characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
Overall Quality Determination			Medium	

<b>Study Citation:</b>	Grace, (2022). Di-isobutyl phthalate (DIBP) use (sanitized).			
<b>HERO ID:</b>	11589992			
<b>Conditions of Use:</b>	Plastic Compounding			
<b>EXTRACTION</b>				
<b>Parameter</b>		<b>Data</b>		
Process description:		Polypropylene Production (PDF Pg. 3-4)“In general, Grace’s pre-catalyst slurry containing DIBP is pumped from the agitated slurry feed tank to the reactor (step K). An aluminum alkyl substance is then fed to the reactor and reacts with the pre-catalyst slurry containing DIBP. This forms the active catalyst. Lastly, the propylene and optional co-monomers are added to the reaction vessel. The final polymer powder is purged of residual hydrocarbons and then extruded into pellets and packaged for sale (step M).During the polymerization process, most of the DIBP reacts to form non-phthalate derivatives (mixtures of alcohols, ethers, ketones, and aldehydes upon hydrolysis).The amount of Grace’s pre-catalyst used during the PP production is typically [REDACTED] kg/MT of PP resin. Therefore, the maximum concentration of Grace pre-catalyst in the final PPresin Is [REDACTED] part per million (ppm). Since DIBP can be up to [REDACTED] of the Grace pre-catalyst formulation, the maximum amount of DIBP potentially contained in the final PP resin is 2.5-10 ppm. This assumes no degradation or loss of the DIBP through this point. In reality, most of the phthalate reacts during polymerization to form non-phthalates.Based on 9 samples of commercial PP resins, the average DIBP detected was 0.46 ppm with a range of 0.16-1.33 ppm.”Disposal of Pre-catalyst drums (PDF Pg. 4)“Lastly, the drums that the Grace product is shipped in must be discussed. After transfer of the material to the agitated slurry feed tank, the drum is rinsed with water into the process sewers of reactor unit (step L). The drums are then dried and recycled off site. Specifications and details regarding our customers’ waste handling and emissions is not fully known to us.”		
<b>EVALUATION</b>				
Domain		Metric	Rating	Comments
Domain 1: Reliability		Metric 1: Methodology	Medium	Report uses high quality data/techniques/methods that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness		Metric 2: Geographic Scope	High	Data are from the U.S.
		Metric 3: Applicability	High	Data are for plastic compounding, an in-scope occupational scenario.
		Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
		Metric 5: Sample Size	N/A	N/A - Process Description.
Domain 3: Accessibility/ Clarity		Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty		Metric 7: Metadata Completeness	N/A	N/A - Process Description.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Grace, (2022). Di-isobutyl phthalate (DIBP) use (sanitized).			
<b>HERO ID:</b>	11589992			
<b>Conditions of Use:</b>	Plastic Converting			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Process description:	Polypropylene Production (PDF Pg. 4)“Note, the PP resin will be further processed by our customer’s customer. This will most likely include heating/melting the PP resin pellets for extrusion or thermal injection molding. Each melt cycle could cause further degradation of any residual DIBP.”Disposal of Pre-catalyst drums (PDF Pg. 4)“Lastly, the drums that the Grace product is shipped in must be discussed. After transfer of the material to the agitated slurry feed tank, the drum is rinsed with water into the process sewers of reactor unit (step L). The drums are then dried and recycled off site. Specifications and details regarding our customers’ waste handling and emissions is not fully known to us.”			
<b>EVALUATION</b>				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	Medium	Report uses high quality data/techniques/methods that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	High	Data are for plastic converting, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	N/A	N/A - Process Description.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	N/A	N/A - Process Description.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Grace, (2024). Offices and facilities worldwide.			
<b>HERO ID:</b>	11924546			
<b>Conditions of Use:</b>	Use as a catalyst			
EXTRACTION				
Parameter	Data			
Number of sites:	Website provides information on number of grace sites (14 total in U.S.)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Website is expected to accurately represent number of sites.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data is for the U.S.	
	Metric 3: Applicability	High	Data is for use as a catalyst, 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. (2024)	
	Metric 5: Sample Size	N/A	Number of sites 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		High		

<b>Study Citation:</b>	Gu, Z., Feng, J., Han, W., Wu, M., Fu, J., Sheng, G. (2010). Characteristics of organic matter in PM2.5 from an e-waste dismantling area in Taizhou, China. Chemosphere 80(7):800-806.			
<b>HERO ID:</b>	1256038			
<b>Conditions of Use:</b>	Disposal			
EXTRACTION				
Parameter		Data		
Chemical concentration:		”DIBP in Wires/Cables: 160 ug/g DIBP in plastic blocks: 180 ug/g”		
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	Low	Data are from China, a non-OECD country.
	Metric 3:	Applicability	High	Data are for the disposal of phthalate-containing wastes, an in-scope occupational sce-nario.
	Metric 4:	Temporal Representativeness	Medium	Data are greater than 10 years old but no more than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (means, standard deviations) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Most critical metadata included.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability is addressed by sampling during the summer and winter. Uncertainty isn’t addressed.
Overall Quality Determination			Medium	



<b>Study Citation:</b>	Guo, Y., Wang, L., Kannan, K. (2014). Phthalates and parabens in personal care products from China: Concentrations and human exposure. Archives of Environmental Contamination and Toxicology 66(1):113-119.			
<b>HERO ID:</b>	1987638			
<b>Conditions of Use:</b>	Personal care products			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	Face cream: 0.3 (ug/g); body or hand lotion: 0.1 (ug/g); face cleanser: 0.6 (ug/g); shampoo: 0.1 (ug/g); body wash: <0.1 (ug/g)			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality [data/techniques/methods] from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	High	Data are for personal care products, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (mean) but discrete samples not provided and distribution not fully characterized.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by testing concentrations in multiple products but uncertainty is not addressed.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	House,, Veritas (2015). Material Safety Data Sheet (MSDS): Diisobutyl Phthalate.			
<b>HERO ID:</b>	6302673			
<b>Conditions of Use:</b>	Use of laboratory chemicals			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	99%			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	From non-OECD country (India)
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (Lab chems)
	Metric 4:	Temporal Representativeness	High	Source is from 2015, which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Inc, A.U. (2015). Azo-Grout 443 Safety Data Sheet.		
<b>HERO ID:</b>	6302645		
<b>Conditions of Use:</b>	Adhesives and sealants		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Chemical concentration:	<30%		
<b>EVALUATION</b>			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Product is from a US supplier.
	Metric 3: Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	High	Source is from 2015, which is less than 10 years old.
	Metric 5: Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Does not address variability or uncertainty.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	Industries,, Tower (2012). Material Safety Data Sheet (MSDS): CornerSealant Adhesive.			
<b>HERO ID:</b>	6302679			
<b>Conditions of Use:</b>	Application of adhesives and sealants			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	10 – 30%			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (adhesives and sealants)
	Metric 4:	Temporal Representativeness	Medium	More than 10 but less than 20 years old (2012)
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Initiators,, United (2019). Safety Data Sheet (SDS): TMCH-HA-M2.			
<b>HERO ID:</b>	6302672			
<b>Conditions of Use:</b>	Plastic Compounding			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	≥25 – <30%			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (plastics compounding)
	Metric 4:	Temporal Representativeness	High	Source is from 2019, which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Jaganmohan, M. (2020). Polypropylene production in the United States from 1990 to 2019 (in 1,000 metric tons).			
<b>HERO ID:</b>	11923464			
<b>Conditions of Use:</b>	Use as a catalyst (polypropylene production)			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	Production of Polypropylene in thousand metric tons: 1990: 3,7702000: 7,1392005: 8,1492010: 7,8272011: 7,4472012: 7,4062013: 7,4522014: 7,4612015: 7,7822016: 7,7822017: 7,8782018: 7,7002019: 7,650			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Website 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 use as a catalyst, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	High	Website is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	High	Statistical distribution of production volumes is fully characterized (discrete sampling data provided).	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability addressed by production data from multiple years but uncertainty is not addressed.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	Jowat Corporation, (2016). Safety Data Sheet (SDS): Jowacoll 110.60.			
<b>HERO ID:</b>	6302625			
<b>Conditions of Use:</b>	Application of adhesives and sealants			
		<b>EXTRACTION</b>		
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	2.5-<5%			
		<b>EVALUATION</b>		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (Application of adhesives and sealants)
	Metric 4:	Temporal Representativeness	High	Source is from 2016, which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	Koniecki, D., Wang, R., Moody, R. P., Zhu, J. (2011). Phthalates in cosmetic and personal care products: Concentrations and possible dermal exposure. Environmental Research 111(3):329-336.			
<b>HERO ID:</b>	788300			
<b>Conditions of Use:</b>	consumer use - personal cosmetic products			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Life cycle description:	dermal (use of lotions)			
Chemical concentration:	<10 ug/g			
Comments:	DIBP was detected in 9 of 252 samples			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Journal is peer reviewed so likely does not contain errors.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Study conducted in Canada, an OECD country
	Metric 3:	Applicability	Uninformative	Data is for a non-occupational scenario and likely cannot be applied to one.
	Metric 4:	Temporal Representativeness	Medium	Study greater than 20 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Provides results, methods and assumptions and sources are generally described.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Provides variability across sources of sampling but does not address uncertainty.
Overall Quality Determination		Uninformative		



<b>Study Citation:</b>	LANXESS, (2021). LANXESS Product Data Sheet.		
<b>HERO ID:</b>	12197257		
<b>Conditions of Use:</b>	Manufacture of Polyurethane Foam for Pipeline Pigs		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Life cycle description:	DIBP is present in polyurethane foam pipeline pigs used to service industrial pipelines. The spreadsheet also alludes that DIBP could be present in formulations for paint additives, polyolefin production, and foundry solutions. (column D)		
Number of sites:	1 site included in this data		
Chemical concentration:	One formulation contains DIBP at approximately 1-5% (column D)		
<b>EVALUATION</b>			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	Medium	Spreadsheet is information directly from a company, but doesn’t reference typical high-quality methods. There are no flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from a US company.
	Metric 3: Applicability	High	This data is for Manufacture of Polyurethane Foam for Pipeline Pigs, which is an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Data are from 2021, which is less than 10 years old.
	Metric 5: Sample Size	Medium	Spreadsheet presents an estimated range of concentrations for DIBP in the product.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Spreadsheet doesn’t cite any sources or provide insight on where the data was taken from.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability is addressed by incorporating a range of product concentrations. Uncertainty isn’t addressed.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	Latini, G. (2005). Monitoring phthalate exposure in humans. Clinica Chimica Acta 361(1-2):20-29.		
<b>HERO ID:</b>	789380		
<b>Conditions of Use:</b>	Manufacture/Import (global PV/Use)		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	Globally, more than 18 billion pounds of phthalates are used each year		
Comments:	Note: this article uses "DiBuP" for di-isobutyl phthalate		
<b>EVALUATION</b>			
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., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3: Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	The report captures operations, equipment, and worker activities that are expected to be reasonably representative of current conditions. 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	Medium	The report provides only limited discussion of the variability and uncertainty in the results.
<b>Overall Quality Determination</b>		<b>Medium</b>	

<b>Study Citation:</b>	Lee, M., Kim, J. H., Lee, D., Kim, J., Lim, H., Seo, J., Park, Y. K. (2018). Health risk assessment on hazardous ingredients in household deodorizing products. International Journal of Environmental Research and Public Health 15(4):744.			
<b>HERO ID:</b>	4730751			
<b>Conditions of Use:</b>	Laboratory reagent			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	99.5% in laboratory reagent			
<b>EVALUATION</b>				
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., and locality-specific factors (e.g., potential differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S.
	Metric 3:	Applicability	High	The report is for an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	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	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 report addresses variability and uncertainty in the results. Uncertainty is well characterized.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	Lee, Y. S., Lee, S., Lim, J. E., Moon, H. B. (2019). Occurrence and emission of phthalates and non-phthalate plasticizers in sludge from wastewater treatment plants in Korea. Science of the Total Environment 692:354-360.				
<b>HERO ID:</b>	6959335				
<b>Conditions of Use:</b>	Disposal				
<b>EXTRACTION</b>					
<b>Parameter</b>	<b>Data</b>				
Chemical concentration: Comments:	DIBP mean concentrations: Domestic WWTPs: 520 ng/g sludge Mixed WWTPs: 760 ng/g sludge Industrial WWTPs: 770 ng/g sludge Table 1 and Fig 1.				
<b>EVALUATION</b>					
Domain	Metric	Rating	Comments		
Domain 1: Reliability	Metric 1:	Methodology	Medium	Methodology is known and expected to be accurate but may not cover all release sources at the site.	
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Korea, an OECD country.	
	Metric 3:	Applicability	High	Data are for the disposal of phthalate-containing wastes, an in-scope occupational sce- nario.	
	Metric 4:	Temporal Representativeness	High	Data are no more than 10 years old.	
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (ranges, means, number of sam- ples) but discrete samples not provided and distribution not fully characterized.	
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	Most critical metadata included.	
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	Uncertainty is addressed in the sampling method and detection ranges. Variability is addressed by sampling at residential and industrial WWTPs.	
<b>Overall Quality Determination</b>			<b>High</b>		

<b>Study Citation:</b>	Lerner, I. (2005). European plastics industry moves from 2-EH, DEHP. Chemical Market Reporter 267(26):26-27.			
<b>HERO ID:</b>	7978846			
<b>Conditions of Use:</b>	Plasticizers			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	In 2003, global sales of plasticizers were estimated to be roughly \$4.9 billion, and the global plastic additives industry was worth about \$14.8 billion, representing nearly 18 billion pounds. About 70 percent of the plasticizer market volume is phthalates, (1/2)			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	Medium	Assessment uses high quality data that are not from frequently-used sources and there are no known quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are global, but EU and US data are the main focus of the article.
	Metric 3:	Applicability	High	Data are for the use of plasticizers in plastic and resin products, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (percentages, production values) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Variability and uncertainty are not addressed.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	Liang, Y., Xu, Y. (2014). Emission of phthalates and phthalate alternatives from vinyl flooring and crib mattress covers: The influence of temperature. Environmental Science & Technology 48(24):14228-14237.			
<b>HERO ID:</b>	3015875			
<b>Conditions of Use:</b>	Floor coverings			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	Content of DnBP in vinyl flooring products: 9 ± 1% (Table 1, pg. 3/10)			
Comments:	The concentration value extracted is for DnBP, which may be similar to DiBP.			
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	Low	The concentration value extracted is for DnBP, which may be similar to DiBP.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 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	Variability and uncertainty is not addressed.
Overall Quality Determination		Medium		

<b>Study Citation:</b>	LLC, A.F. (2015). Material safety data sheet: CP310 Fire rated acrylic intumescent caulk.			
<b>HERO ID:</b>	6302619			
<b>Conditions of Use:</b>	Adhesives and Sealants			
		<b>EXTRACTION</b>		
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	5-10%			
		<b>EVALUATION</b>		
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2015, which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	Lord Corporation, (2000). Material Safety Data Sheet (MSDS): LORD ACCELERATOR 17.			
<b>HERO ID:</b>	6302626			
<b>Conditions of Use:</b>	Application of adhesives and sealants			
EXTRACTION				
Parameter		Data		
Chemical concentration:		<25%		
EVALUATION				
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (adhesives and sealants)
	Metric 4:	Temporal Representativeness	Low	More than 20 years old (2000).
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
Overall Quality Determination			Medium	



<b>Study Citation:</b>	Ltd., Colorlord (2009). Product Safety Data Sheet (PSDS): Blue Label Washable PVA Adhesive.			
<b>HERO ID:</b>	6302658			
<b>Conditions of Use:</b>	Application of adhesives and sealants			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	Unknown			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	From an OECD country (England)
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (adhesives and sealants)
	Metric 4:	Temporal Representativeness	Medium	More than 10 but less than 20 years old (2009)
	Metric 5:	Sample Size	Low	Only presence of DIBP confirmed, no concentration presented.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

<b>Study Citation:</b>	Ltd., I.(. (2010). Safety Data Sheet (SDS): IVS 150.			
<b>HERO ID:</b>	6311813			
<b>Conditions of Use:</b>	Application of adhesives and sealants			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	1 – 5%			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (adhesives and sealants)
	Metric 4:	Temporal Representativeness	Medium	More than 10 but less than 20 years old (2010)
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Lu, X., Xu, X., Lin, Y., Zhang, Y., Huo, X. (2018). Phthalate exposure as a risk factor for hypertension. Environmental Science and Pollution Research 25(21):20550-20561.			
<b>HERO ID:</b>	4728432			
<b>Conditions of Use:</b>	Manufacturing			
EXTRACTION				
Parameter		Data		
Production, import, or use volume:		The global annual production of phthalates is estimated to be 11 billion pounds (Sirivarasai et al. 2013).		
Life cycle description:		Adhesives, cosmetics, industrial solvents, and glues		
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	Low	The data are from a non-OECD country, and locality-specific factors (e.g., potentially greater differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S., or the country of origin is not specified.
	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	N/A	Distribution of samples is qualitative or characterized by no statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Assessment or report clearly documents results, methods, and assumptions.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			High	

<b>Study Citation:</b>	Lyondell Chemical Co., (2022). LyondellBasell catalyst production expansion adds life to infrastructure projects.			
<b>HERO ID:</b>	11924004			
<b>Conditions of Use:</b>	Use as a Catalyst			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Number of sites:	Document discusses the startup of a new catalyst production site in Frankfurt, Germany.			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are for Germany, an OECD country.	
	Metric 3: Applicability	High	Data are for Use as a Catalyst, an in-scope occupational scenario.	
	Metric 4: Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	High	Discussion of one discrete site	
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.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	MAPEI, (2018). Safety Data Sheet (SDS): RESFOAM SS 75.			
<b>HERO ID:</b>	6302623			
<b>Conditions of Use:</b>	Application of adhesives and sealants			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	25-50%			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (Application of adhesives and sealants)
	Metric 4:	Temporal Representativeness	High	Source is from 2018, which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	MAPEI, (2009). Material Safety Data Sheet (MSDS): Mondo PU-105 - Part A.			
<b>HERO ID:</b>	6302636			
<b>Conditions of Use:</b>	Application of adhesives and sealants			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	1-5%			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (adhesives and sealants)
	Metric 4:	Temporal Representativeness	Medium	More than 10 but less than 20 years old (2009)
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Mersiowsky, N. (2002). Long-term fate of PVC products and their additives in landfills. Progress in Polymer Science 27(10):2227-2277.			
<b>HERO ID:</b>	6826007			
<b>Conditions of Use:</b>	processing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	Phthalates make up 30% of generic PVC cable and 35% of generic PVC flooring.			
Comments:	Doesn't specifically mention DIBP			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	uses high quality data and/or techniques or sound methods that
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	Data are from Germany, an OECD country.
	Metric 3:	Applicability	High	Within the scope of the risk evaluation
	Metric 4:	Temporal Representativeness	Medium	The report is generally more than 10 yearsbut no more than 20 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (medians, minimums and maximums, percentages) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Data sources are generally described but not fully transparent.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Uncertainty is addressed in the life cycle assessment methods. Variability is not addressed.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	11360398			
<b>Conditions of Use:</b>	Disposal			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	Total Plastic Waste Managed in U.S. in 2019:PET: 5,986 ktHDPE: 7,910 ktPP: 8,189 ktLDPE/LLDPE: 15,139 ktPVC: 699 ktPS/EPS: 3,094 ktOther: 3,115 kt			
Life cycle description:	Percentage of total plastic waste managed by category:PET: 14%HDPE: 18%PP: 19%LDPE/LLDPE: 34%PVC: 2%PS/EPS: 7%Other: 7%			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Data are from the U.S.
	Metric 3:	Applicability	Medium	Data are for disposal, an in-scope occupational scenario; however, the data are not chemical specific.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	High	Statistical distribution of samples is fully characterized (discrete sampling data provided).
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by discussing multiple types of plastic products but uncertainty is not addressed.
Overall Quality Determination		High		



<b>Study Citation:</b>	MME, (2018). Safety Data Sheet (SDS): Universal resin.			
<b>HERO ID:</b>	6302629			
<b>Conditions of Use:</b>	Application of adhesives and sealants			
		<b>EXTRACTION</b>		
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	≥25 – ≤50%			
		<b>EVALUATION</b>		
Domain		Metric	Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	From an OECD country (Canada)
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (adhesives and sealants)
	Metric 4:	Temporal Representativeness	High	Source is from 2018, which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	MME, (2018). Safety Data Sheet (SDS): Flexible Accelerator.			
<b>HERO ID:</b>	6302631			
<b>Conditions of Use:</b>	Application of adhesives and sealants			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	≥50 – ≤75%			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	From an OECD country (Canada)
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (adhesives and sealants)
	Metric 4:	Temporal Representativeness	High	Source is from 2018, which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	MME, (2018). Safety Data Sheet (SDS): Universal Accelerator.			
<b>HERO ID:</b>	6302638			
<b>Conditions of Use:</b>	Application of adhesives and sealants			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	≥50 – ≤75%			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	From an OECD country (Canada)
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (adhesives and sealants)
	Metric 4:	Temporal Representativeness	High	Source is from 2018, which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	OECD, (2018). Socio-economic assessment of phthalates.		
<b>HERO ID:</b>	7681900		
<b>Conditions of Use:</b>	Plasticizers		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Production, import, or use volume:	The phthalate plasticizer market currently stands at around 5.5 million tonnes per year. (15/90)		
Process description:	Phthalates are esters of phthalic acid, made by reacting phthalic anhydride with alcohols from methanol and ethanol to tridecyl (C13) alcohol. (15/90)		
Chemical concentration:	Phthalates can contribute as much as 50% of the weight of PVC materials. (15/90)		
<b>EVALUATION</b>			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data from frequently-used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data is from an OECD report.
	Metric 3: Applicability	High	Data are for plasticizers in plastic and resin manufacturing, an in-scope occupational scenario.
	Metric 4: Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.
	Metric 5: Sample Size	N/A	Process description.
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	Variability and uncertainty are not addressed.
<b>Overall Quality Determination</b>		<b>High</b>	

<b>Study Citation:</b>	Pak, V. M., Mccauley, L. A. (2007). Risks of phthalate exposure among the general population: Implications for occupational health nurses. American Association of Occupational Health Nurses Journal 55(1):12-17.			
<b>HERO ID:</b>	1598544			
<b>Conditions of Use:</b>	Personal Care Products			
EXTRACTION				
Parameter		Data		
Number of sites:		Approximately 81,000 beauty salons in the U.S.		
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	Medium	Data are for commercial use of personal care products, which is similar to the in-scope occupational scenario commercial use of paints and coatings.
	Metric 4:	Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	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	

<b>Study Citation:</b>	Phenova (2017). Custom 8061 Phthalates Mix Safety Data Sheet.			
<b>HERO ID:</b>	6301564			
<b>Conditions of Use:</b>	Laboratory Chemicals			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	0.1%			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2017, which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Plexus,, ITW (2004). Material Safety Data Sheet (MSDS): Formica Solid Surfacing Activator.			
<b>HERO ID:</b>	6302624			
<b>Conditions of Use:</b>	Application of paints and coatings			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	30-60%			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (Application of paints and coatings)
	Metric 4:	Temporal Representativeness	Low	More than 20 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Polymers,, I.P. (2015). Safety Data Sheet (SDS): Plexus MA685 Adhesive/Clear Welder Activator.			
<b>HERO ID:</b>	6302628			
<b>Conditions of Use:</b>	Application of adhesives and sealants			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	30-40%			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (adhesives and sealants)
	Metric 4:	Temporal Representativeness	High	Source is from 2015, which is less than 10 years old.
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>			<b>High</b>	



<b>Study Citation:</b>	programs, E.O. (1974). Air pollution control engineering and cost study of the paint and varnish industry.			
<b>HERO ID:</b>	6580284			
<b>Conditions of Use:</b>	Formulation of paint and varnish			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	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.			
Process description:	Mixing or dispersing pigment and vehicle to give the final product. The paint vehicle is defined as the liquid portion of the paint and consists of volatile solvent or dispersing medium and non-volatile binder such as oils and resins. The non-volatile portion is also called the vehicle solid or film former. The incorporation of the pigment in the paint vehicle is accomplished by a combination of grinding and dispersion or dispersion alone. When it is necessary to further grind the raw pigment, pebble or steel ball mills are normally used. With the advent of fine particle grades of pigment and extenders, as well as the wide spread use of wetting agents, the trend is toward milling methods that are based on dispersion without grinding. Dispersion consists of breaking up of the pigment clusters and agglomerates, followed by wetting of the individual particles with the binder or vehicle. Some of the more popular methods currently being used are high-speed disc impellers, high speed impingement mills and the sand mill. // There are two basic types of varnishes, spirit varnishes and oleoresinous varnishes.2 Spirit varnishes are formed by dissolving a resin in a solvent and they dry by evaporation of the solvent. The dry film formed undergoes no substantial change in the process of drying and is classified as non-convertible. Varnish is cooked in both portable kettles and large reactors. Kettles are used only to a limited extent and primarily by the smaller manufacturers. The very old, coke fired, 30 gallon capacity copper kettles are no longer used. The varnish kettles which are used, have capacities of 150 to 375 gallons. These are fabricated of stainless steel, have straight sides and are equipped with three or four-wheel trucks. Heating is done with natural gas or fuel oil for better temperature control. The kettles are fitted with retractable hoods and exhaust pipes, some of which may incorporate solvent condensers. Cooling and thinning is normally done in special rooms. // Source contains more information on raw materials, specific processes, and equipment.			
Number of sites:	The industry is made up of about 1,500 companies operating about 1,700 plants			
<b>EVALUATION</b>				
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	Low	The report 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	High	The report provides only limited discussion of the variability and uncertainty in the results.
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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:	Formulation of paint and varnish		
Domain	Metric	EVALUATION Rating	Comments
Overall Quality Determination		High	

<b>Study Citation:</b>	Restek Corp, (2019). 33227/EPA Method 8061A Phthalate Esters Mixture.			
<b>HERO ID:</b>	6302566			
<b>Conditions of Use:</b>	Laboratory Chemical			
EXTRACTION				
Parameter	Data			
Chemical concentration:	0.1%			
EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2023, which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
Overall Quality Determination			Medium	

<b>Study Citation:</b>	RFCI, (2020). Comments of the Resilient Floor Covering Institute (RFCI) on the Safer Products for Washington Priority Consumer Products draft report to Legislature.			
<b>HERO ID:</b>	10472417			
<b>Conditions of Use:</b>	Plastic and rubber products			
EXTRACTION				
Parameter	Data			
Life cycle description:	Plasticizers, such as DINP, are widely used to make inherently rigid materials, such as PVC, soft and flexible. Indeed, 95% of DINP is used in PVC applications. DINP does not chemically bind to the PVC, but is incorporated into it during processing, to allow it to flex. Because DINP processes efficiently (it improves PVC melt viscosity), it takes less time and lower temperatures to incorporate it into the PVC, and to produce the finished product. Accordingly,manufacturing using the product-chemical combination is energy efficient.			
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	The report is for an occupational scenario within the scope of the risk evaluation but information is not chemical specific.
	Metric 4:	Temporal Representativeness	High	The report is generally no more than 10 years old.
	Metric 5:	Sample Size	N/A	N/A - Life Cycle Description
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	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			Medium	

<b>Study Citation:</b>	Sigma-Aldrich, (2020). Diisobutyl phthalate safety data sheet.			
<b>HERO ID:</b>	6302634			
<b>Conditions of Use:</b>	Laboratory Chemicals			
		<b>EXTRACTION</b>		
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	<=100%			
		<b>EVALUATION</b>		
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation.
	Metric 4:	Temporal Representativeness	High	Source is from 2020, which is less than 10 years old.
	Metric 5:	Sample Size	Low	Single value - no distribution/statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	Strong-Tie., Simpson (2014). Safety Data Sheet (SDS): AT (AT10, AT13, AT30, AT).			
<b>HERO ID:</b>	6302675			
<b>Conditions of Use:</b>	Application of adhesives and sealants			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	20 – 30%			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (adhesives and sealants)
	Metric 4:	Temporal Representativeness	Medium	More than 10 but less than 20 years old (2014)
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	SUNY, (2019). Phthalates in infant cotton clothing: Occurrence and implications for human exposure. Science of the Total Environment 683:109-115.			
<b>HERO ID:</b>	5432967			
<b>Conditions of Use:</b>	Concentration on cotton clothing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	See Table 1: concentration of DIBP is 0.27 ug/g (min), 0.38 ug/g (25th%), 0.46 ug/g (median), 0.69 ug/g (75th%), and 10.1 ug/g (max) on infant cotton clothing			
<b>EVALUATION</b>				
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	Low	The data are from a non-OECD country, and locality-specific factors (e.g., potentially greater differences in regulatory occupational exposure or emission limits, industry/ process technologies) may impact exposures or releases relative to the U.S., or the country of origin is not specified.
	Metric 3:	Applicability	Low	The report is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, such as a consumer DIY scenario that is similar to a worker scenario.
	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	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	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	TACC,, ITW (2012). Safety Data Sheet (SDS): STA'-PUT 2-Component Solid Surfacing Adhesive (10:1 Ratio) - All Colors.			
<b>HERO ID:</b>	6302639			
<b>Conditions of Use:</b>	Application of adhesives and sealants			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	25-50%			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (adhesives and sealants)
	Metric 4:	Temporal Representativeness	Medium	More than 10 but less than 20 years old (2012)
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>			<b>Medium</b>	



<b>Study Citation:</b>	Toxicology Excellence for Risk Assessment (TERA) (2016). Exposure assessment: Potential for the presence of phthalates in specified materials at concentrations above 0.1 percent.
<b>HERO ID:</b>	5155525
<b>Conditions of Use:</b>	Processing - plasticizer/catalyst

**EXTRACTION**

Parameter	Data
Life cycle description:	Ethylene-butene (EB) copolymer is described as 1-butene, polymer with ethylene; ethylene polymer with 1-butene; or poly(ethylene-co-1-butene) polymer. The polymer is made from the monomers, (poly)ethylene and 1-butene. Both monomers can be used to manufacture high density polyethylene (HDPE) and linear low density polyethylene (LLDPE)
Process description:	No information was identified that indicated that phthalates are used as additives in the manufacture of EBR. However, heterogeneous Ziegler-Natta catalysts have phthalates such as DIBP or DEHP as internal donors. These catalysts may survive the polymerization process, with the potential for DIBP, DBP and DEHP to theoretically be present in concentrations of about 1 mg/kg (1 ppm, or 0.0001 percent) in the final resins. Several methods for EBR manufacturing have been made but the one likely to use DIBP is: homogenous vanadium-based systems or heterogeneous Ziegler-Natta catalysts at higher temperature to produce EBR with a multiblock structure in which the butadiene is essentially trans-1,4-inserted. For EBC: Ethylene and 1-butene can be used to manufacture HDPE and LLDPE, but no phthalates are reportedly used as additives in the manufacture of HDPE or LLDPE. However, Ziegler-Natta catalysts are used in the production of polyethylene (PE) polymers. In preparing these catalysts, phthalates such as DIBP or DEHP are often used as internal donors. Based on the available information searched for this project, there is no evidence that the specified phthalates are added as a raw material during manufacturing or processing of EPM and EPDM. However, Ziegler-Natta catalysts are used in the production of EPM and EPDM. Available information indicates that these catalysts are prepared using magnesium- and titanium (IV) chloride, and an internal donor, which is very often a phthalate such as DBP, DIBP or DEHP. Several additives may be blended with GPS, MIPS, or SHIPS. Kirk-Othmer (2014) reported that plasticizers are used in the manufacture and/or processing of these types of styrene polymers. Among these plasticizers, are phthalate esters; however, the specific phthalate esters are not mentioned and it is not possible to determine if any of the specified phthalates for this project are the same phthalate esters used in GPS, MIPS, or SHIPS. Additionally, Ziegler-Natta catalysts are used in the polymerization of polybutadiene, a potential starting material for the production of the rubber-modified, high-impact polystyrenes. These catalysts "are prepared starting from a pre-catalyst (proCAT) mixture, containing, besides magnesium- and titanium (IV) chloride, an internal donor, which is very often a phthalate such as dibutyl phthalate (DBP), diisobutyl phthalate (DIBP), or bis(2-ethylhexyl) phthalate (DEHP)".
Chemical concentration:	May be present in EBR, EBC, EPM/EPDM, at conc. of 1ppm. Unlikely for GPS/MIPS/SHIPS/SBC to have higher than 0.1% of phthalates present.
Comments:	EBR - ethylene-butadiene resins; EBC - ethylene-butene copolymers; EPM/EPDM - ethylene-propylene monomer/ethylene-propylene-diene monomer; GPS/MIPS/SHIPS/SBC - Polystyrene (crystal and general-purpose)/medium-impact/and super-high-impact grades/Styrene-butadiene copolymers. Long process descriptions for manufacturing are provided in the document for each different method and different type of plastic that could contain DIBP.

**EVALUATION**

Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from mostly well known sources and would not indicate quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data is for US
	Metric 3: Applicability	High	Data is directly applicable to conditions of use for processing.
	Metric 4: Temporal Representativeness	High	Report is less than 10 years old
	Metric 5: Sample Size	N/A	Process/facility/Engineering data
Domain 3: Accessibility/ Clarity			

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<b>Study Citation:</b>		Toxicology Excellence for Risk Assessment (TERA) (2016). Exposure assessment: Potential for the presence of phthalates in specified materials at concentrations above 0.1 percent.		
<b>HERO ID:</b>		5155525		
<b>Conditions of Use:</b>		Processing - plasticizer/catalyst		
Domain		Metric	<b>EVALUATION</b>	
			Rating	Comments
Metric 6:		Metadata Completeness	Medium	Report clearly documents results, methods and assumptions. Sources generally described.
Domain 4: Variability and Uncertainty				
Metric 7:		Metadata Completeness	Medium	Addresses variability across multiple different plastics. Does not address uncertainty.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	U.S. Consumer Product Safety Commission (CPSC) (2011). Toxicity review of diisobutyl phthalate (DiBP, CASRN 84-69-5).
<b>HERO ID:</b>	5155528
<b>Conditions of Use:</b>	Manufacturing; processing

EXTRACTION	
Parameter	Data
Production, import, or use volume:	U.S. production of DiBP is low and has been combined with several other phthalates (benzyl, undecyl dodecyl, n-butyl cyclohexyl, cyclohexyl, n-butyl-2-ethylhexyl, dicapryl, isooctyl isodecyl, diethylene glycol, and cyclohexyl-2-ethylhexyl phthalate) in marketing reports. Historically, combination production of these phthalates has increased from 5,000 (1982) to 13,000 metric tons (2004). U.S. consumption of DiBP is low and has been combined with several other phthalates (undecyl dodecyl, n-butyl cyclohexyl, cyclohexyl, n-butyl-2-ethylhexyl, isooctyl isodecyl, diethylene glycol, isooctyl diphenyl, cyclohexyl-2-ethylhexyl, and di-(butoxyethyl) phthalate) in marketing reports. Historically, the combined production of these phthalates has increased from 5,000 (1982) to 14,000 metric tons (2004). The U.S. production range in 2002 was > 500,000 - 1 million pounds based on the nonconfidential production volume information submitted under Inventory Update Rule (IUR). In an authorized IUCLID data sheet the quantity of DiBP manufactured and/or used in Europe is indicated in the range of 10,000 to 50,000 tons/year.
Process description:	In general, DiBP is manufactured commercially in a closed system by catalytically esterifying phthalic anhydride with n-butyl alcohols (isobutanol). As with other phthalates, the unreacted alcohols are recovered and reused, and the DiBP mixture is purified by vacuum distillation or activated charcoal. The purity of DiBP can achieve 99% or greater using current manufacturing processes. The remaining fraction of DiBP may contain a maximum of 0.1% water. The world-wide production of both DBP and DiBP was estimated at 450,000 tons/year.
Number of sites:	2. DiBP is currently manufactured in Tennessee (Eastman Chemical Company) and North Carolina (Unitex Chemical Company under the trade name Uniplex 155). Eastman Chemical Company will be discontinuing dibutyl phthalate (DBP) (and presumably DiBP) production, however, in December of 2011.
Chemical concentration:	Cited studies on Table 6.1 provide various DiBP concentration levels in products not in scope and food products. House dust listed had a conc. of 34 mg/kg and indoor air had 390 ng/m <sup>3</sup> . Both of those values are medians

EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data and does not indicate flaws or quality issues.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data is for US
	Metric 3: Applicability	High	Report is within scope of the risk evaluation.
	Metric 4: Temporal Representativeness	Medium	Most data is greater than 10 years old
	Metric 5: Sample Size	Medium	Data characterized by range with uncertain statistics
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Report documents results and assumptions. Sources generally described but not fully transparent
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Addresses variability across different countries and years. Does not address uncertainty.

## Overall Quality Determination

**High**

<b>Study Citation:</b>	U.S. EPA, (2002). Flexographic ink options: A cleaner technologies substitutes assessment. Volume 1.		
<b>HERO ID:</b>	10293388		
<b>Conditions of Use:</b>	Industrial and commercial use in Ink, toner and colorant products		
EXTRACTION			
Parameter	Data		
Production, import, or use volume:	In 2000, the industry overall used more than 513 million pounds of ink. Water-based inks represent 65% of all inks used during flexographic printing, where the remaining 35% are solvent-based inks. The U.S. exported about 115 million pounds of printing ink in 1998. Page 78 of the pdf provides a table of the top 20 manufacturers of inks.		
Process description:	Source describes solvent-based ink process, water-based ink process, and UV cured ink process. The source also describes the type of substrates typically used during manufacturing which includes, corrugated and preprinted containers, flexible film packaging, folding cartons, labels and tag, and other (pdf pages 74-75). Source also lists typical components of inks (pdf pages 69-71)		
Number of sites:	914 commercial printing with flexographic printing as the primary print process but 2,300 facilities operate flexographic printing in addition to other printing. A total of 30,000 employees for facilities with flexographic printing as the primary print process and over 80% have fewer than 50 employees		
EVALUATION			
Domain	Metric	Rating	Comments
Domain 1: Reliability	Metric 1: Methodology	High	The assessment or report uses high quality data and/or techniques or sound methods that are from frequently used sources.
Domain 2: Representativeness	Metric 2: Geographic Scope	High	The data are from the United States and are representative of the industry being evalu-ated.
	Metric 3: Applicability	Medium	The report is for an occupational scenario within the scope of the risk evaluation but information is not chemical specific.
	Metric 4: Temporal Representativeness	Low	Most of the data is from more than 20 years back.
	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	High	Variability is addressed by looking at different years and uncertainty is also addressed.
Overall Quality Determination		High	

<b>Study Citation:</b>	U.S. EPA, (2020). 2020 CDR: Commercial and consumer use.			
<b>HERO ID:</b>	10366189			
<b>Conditions of Use:</b>	Manufacture and Import			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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.			
Physical form:	Provides physical form.			
Number of workers:	Provides number of workers.			
<b>EVALUATION</b>				
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.
	Metric 4:	Temporal Representativeness	High	EPA used data from the 2020 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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	U.S. EPA, (2019). Synthetic turf field recycled tire crumb rubber research under the Federal Research Action Plan, Final report part 1: Tire crumb rubber characterization, volume 1.
<b>HERO ID:</b>	11803647
<b>Conditions of Use:</b>	Commercial Use - Toys, playground, and sporting equipment

EXTRACTION	
Parameter	Data
Process description:	Page 43: "Synthetic turf systems have been installed in the United States since the 1960s. Currently, there are between 12,000 and 13,000 synthetic turf sports fields in the United States, with approximately 1,200 to 1,500 new installations each year (Synthetic Turf Council et al., 2016). These fields, which are designed to simulate the experience of practicing and playing on grass fields, are installed at a variety of venues, including parks, schools, colleges, stadiums and practice fields, and are used by a wide variety of people, such as professional, college and youth athletes; coaches; referees; and recreational users of all ages. It is estimated that 95% of synthetic turf fields utilize recycled rubber infill exclusively or in mixture with sand or alternative infills (Synthetic Turf Council et al., 2016). Infill is added for ballast, support for the synthetic grass blades and as cushioning for field users. The recycled rubber infill material used on these fields is produced from waste automobile and truck tires, which are reprocessed using either an ambient or cryogenic method to create "crumb"-sized material, with reported approximate diameters ranging from 1 to 6 mm (Lim & Walker, 2009). In addition to its use in synthetic turf, recycled tire material is increasingly being used for playground surfaces in the United States."
Chemical concentration:	Table 2-5, Page 70: "0.50 mg/kg for DIBP"

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 fabrication of final product from articles, an in-scope occupational scenario.
	Metric 4:	Temporal Representativeness	High	Report is based on current industry conditions and data no more than 10 years old.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by limited statistics (mean) but discrete samples not provided and distribution not fully characterized.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	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 discussion of methodologies. Variability addressed by standard deviation statistics.

<b>Overall Quality Determination</b>	<b>High</b>
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<b>Study Citation:</b>	U.S. EPA, (2019). Synthetic turf field recycled tire crumb rubber research under the Federal Research Action Plan, Final report part 1: Tire crumb rubber characterization appendices, volume 2.
<b>HERO ID:</b>	11845553
<b>Conditions of Use:</b>	Commercial Use - Toys, playground, and sporting equipment

EXTRACTION	
Parameter	Data
Process description:	Pages 24-26: "Synthetic turf fields are installed for various activities played at both the recreational and professional level, including football, soccer, and lacrosse. There are approximately eight major synthetic field installers in the United States with the largest four being national in scope, installing coast to coast (Sprinturf, 2016). An estimated 95 percent of the existing fields in North America use recycled rubber infill exclusively or in a mixture with sand or alternative infills; the remaining five percent contain only alternative infills (STC et al., 2016a). STC also reports that the use of exclusively alternative infills in new installations increased in 2016 (STC et al, 2016b). ... Fields can be infilled with material in a few different ways. Sand is often used as a lower layer infill material to act as a ballast for the turf component. On top of this lower layer either will be tire crumb rubber or a sand/tire crumb rubber mix, topped by additional tire crumb rubber. Other fields can use an infill exclusively comprised of tire crumb rubber. On a small number of fields, tire crumb rubber could be coated with paint, typically green, either for aesthetic purposes or heat (Figure 5: Tire crumb rubber is placed on a field in layers during control (FieldTurf, n.d.-d; Sprinturf, n.d.). installation (USEPA, 2016c). To a much lesser extent, natural materials (e.g., ground coconut husk), ethylene propylene diene monomer (EPDM), or thermoplastic elastomers (TPE) granules are used as the complete infill. These materials also can be used as the uppermost layer of infill (STC et al., 2016a). Infill material typically is spread using small utility vehicles that make multiple passes across entire fields, laying the material down in thin layers that are placed one on top of the other until the appropriate height is reached (Figure 5). Additional machinery can be used to drag or brush the blades upright to allow the material to fall between the blades (STC, 2011). ... It is important to maintain an appropriate amount of infill in the field for proper cushioning and firmness. Tire crumb rubber can be lost for a number of reasons, such as migration in the shoes and clothing of athletes, in weather events such as rain or snow, and through routine maintenance practices (Pennsylvania State University Center for Sports Surface Research, 2016). Because of tire crumb rubber migration, new infill material sometimes is added to existing fields to refresh or replace the tire crumb rubber that is lost over time"
Throughput:	Page 20: "An estimated 4.77 million tons of waste tires were generated in 2013, and 40.5 percent, or 1.93 million tons, were recovered through recycling and production of retreaded tires (U.S. EPA, 2015). Much of the waste tire material is used in fuel markets, including cement kilns, utility boilers, industrial boilers, pulp and paper mills, and dedicated scrap tire-to-energy facilities (RMA, 2016a). In 2013, approximately 172,000 tons of scrap tires were converted to tire shreds for use in road and landfill construction, septic tank leach fields, and other construction applications (RMA, 2016a). Approximately 975,000 tons of scrap tires (i.e., approximately 59.5 million tires) were used in the ground rubber applications market, which includes the manufacture of new rubber products, rubber-modified asphalt, and playground and sports surfacing (RMA, 2014 and 2016a). The Rubber Manufacturers Association (RMA) estimated that in 2013, 33 percent of these scrap tires were used in molded/extruded products, 31 percent in playground mulch, 17 percent in sports surfaces, 7 percent in asphalt, 6 percent in automotive products, and 6 percent were exported (RMA, 2014)"
Chemical concentration:	Summary statistics for DIBP concentration in rubber crumbs, Page 232: "n = 40; Mean = 1.2 mg/kg; Std Dev = 1.8 mg/kg; 10th Percentile = 0.04 mg/kg; 25th Percentile = 0.22 mg/kg; 50th Percentile = 0.59 mg/kg; 75th Percentile = 1.4 mg/kg; 90th Percentile = 3.2 mg/kg; Max = 9.1 mg/kg"

EVALUATION				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	Report uses high quality data and research methods from frequently-used sources working in conjunction with the CDC and ATSDAR to develop QA/QC procedures for re-search activities.
	Metric 2:	Geographic Scope	High	Data are from the U.S.
Domain 2: Representativeness	Metric 3:	Applicability	High	Data are for fabrication of final product from articles, an in-scope occupational scenario

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<b>Study Citation:</b>		U.S. EPA, (2019). Synthetic turf field recycled tire crumb rubber research under the Federal Research Action Plan, Final report part 1: Tire crumb rubber characterization appendices, volume 2.		
<b>HERO ID:</b>		11845553		
<b>Conditions of Use:</b>		Commercial Use - Toys, playground, and sporting equipment		
Domain		Metric	EVALUATION	
			Rating	Comments
	Metric 4:	Temporal Representativeness	Medium	Report is based on data greater than 10 years old but no more than 20 years old and industry conditions that are expected to be representative of current industry conditions.
	Metric 5:	Sample Size	Medium	Sample distribution characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity				
	Metric 6:	Metadata Completeness	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 Appendix C of the report. Variability addressed by summary statistics and standard deviation for presented data.
<b>Overall Quality Determination</b>			<b>High</b>	



<b>Study Citation:</b>	U.S. EPA, (2012). Phthalates action plan.			
<b>HERO ID:</b>	4565597			
<b>Conditions of Use:</b>	Manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>		<b>Data</b>		
Production, import, or use volume:		Phthalates are produced in high volume, over 470 million pounds per year (EPA 2006).		
Life cycle description:		DIBP is considered a specialty plasticizer, too volatile to be used in PVC, and is often combined with other phthalates. As such, it is used in nitrocellulose, cellulose ether, and polyacrylate and polyacetate dispersions (ECPI, 2009). Based on a comparison of TRI releases to IUR data, production and import volumes indicate that the vast majority (likely between 95% and 99.9%) of phthalates can be expected to be incorporated into plastics and other products.		
<b>EVALUATION</b>				
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	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	N/A	Distribution of samples is qualitative. Facility/process data
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.
<b>Overall Quality Determination</b>			<b>High</b>	

<b>Study Citation:</b>	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.
<b>HERO ID:</b>	7310513
<b>Conditions of Use:</b>	Paint and Varnish Manufacturing

EXTRACTION	
Parameter	Data
Process description:	Process description on page 29. // The manufacture of paint involves the dispersion of a colored oil or pigment in a vehicle, usually an oil or resin, followed by the addition of an organic solvent for viscosity adjustment. Only the physical processes of weighing, mixing, grinding, tinting, thinning, and packaging take place. No chemical reactions are involved. // The manufacture of varnish also involves the mixing and blending of various ingredients to produce a wide range of products. However in this case, chemical reactions are initiated by heating. Varnish is cooked in either open or enclosed gas-fired kettles for periods of 4 to 16 hours at temperatures of 93 to 340°C (200 to 6500 P).

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	Medium	The report is for an occupational scenario within the scope of the risk evaluation. Not Specific to DIBP.
	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	Process Description. Information is qualitative.
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.

<b>Overall Quality Determination</b>	<b>Medium</b>
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<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	7310513			
<b>Conditions of Use:</b>	Plastics Manufacturing			
EXTRACTION				
Parameter	Data			
Process description:	pthmpound (monomer), usually a gas or liquid, into high molecular weight noncrystalline solids. The manufacture of the basic monomer is not considered part of the plastics industry and is usually accomplished at a chemical or petroleum plant. Additional description provided.			
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	Medium	The report is for an occupational scenario within the scope of the risk evaluation. Not specific to DIBP.
	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	Process description. Information is qualitative.
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	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	7310513			
<b>Conditions of Use:</b>	Printing ink Manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Process description:	Process description on page 75. There are 3 general processes in the manufacture of printing inks: (1) cooking the vehicle and adding dyes, (2) grinding of a pigment into the vehicle using a roller mill, and (3) replacing water in the wet pigment pulp by an ink vehicle (commonly known as the flushing process).3 The ink "varnish" or vehicle is generally cooked in large kettles at 200 to 600°F (93 to 315°C) for an average of 8 to 12 hours in much the same way that regular varnish is made. Mixing of the pigment and vehicle is done in dough mixers or in large agitated tanks. Grinding is most often carried out in 3-roller or 5-roller horizontal or vertical mills. Additional description provided.			
<b>EVALUATION</b>				
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	Medium	The report is for an occupational scenario within the scope of the risk evaluation. Not specific to DIBP.
	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	Process description. Information is qualitative.
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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	7310513			
<b>Conditions of Use:</b>	Soap and Detergent Manufacturing			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Process description:	Process description on page 77. The term "soap" refers to a particular type of detergent in which the water-solubilized group is carboxylate and the positive ion is usually sodium or potassium. The largest soap market is bar soap used for personal bathing. Synthetic detergents replaced soap powders for home laundering in the late 1940s, because the carboxylate ions of the soap react with the calcium and magnesium ions in the natural hard water to form insoluble materials called lime soap. Some commercial laundries that have soft water continue to use soap powders. Metallic soaps are alkali-earth or heavy-metal long-chain carboxylates that are insoluble in water but soluble in non-aqueous solvents. They are used as additives in lubricating oils, greases, rust inhibitors, and jellied fuels. The term "synthetic detergent products" applies broadly to cleaning and laundering compounds containing surface-active (surfactant) compounds along with other ingredients. Heavy-duty powders and liquids for home and commercial laundry detergent comprise 60 to 65 percent of the U. S. soap and detergent market and were estimated at 2.6 megagrams (Mg) (2.86 million tons) in 1990. Additional description provided.			
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	Medium	The report is for an occupational scenario within the scope of the risk evaluation. Not specific to DIBP.	
	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	Process description. Information is qualitative.	
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		

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	7310513			
<b>Conditions of Use:</b>	Synthetic fiber Manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Process description:	Process description on page 85. Semi-synthetics are formed from natural polymeric materials such as cellulose. True synthetics are products of the polymerization of smaller chemical units into long-chain molecular polymers. Fibers are formed by forcing a viscous fluid or solution of the polymer through the small orifices of a spinnerette (see Figure 6.9-1) and immediately solidifying or precipitating the resulting filaments. This prepared polymer may also be used in the manufacture of other non-fiber products such as the enormous number of extruded plastic and synthetic rubber products. Additional description provided.			
<b>EVALUATION</b>				
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	Medium	The report is for an occupational scenario within the scope of the risk evaluation. Not specific to DIBP.
	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	Process description. Information is qualitative.
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.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	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.			
<b>HERO ID:</b>	7310513			
<b>Conditions of Use:</b>	Synthetic rubber Manufacturing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Process description:	Process description on page 107. Two types of polymerization reaction are used to produce styrene-butadiene copolymers, the emulsion type and the solution type. This section addresses volatile organic compound (VOC) emissions from the manufacture of copolymers of styrene and butadiene made by emulsion polymerization processes. The emulsion products can be sold in either a granular solid form, known as crumb, or in a liquid form, known as latex. Additional description provided			
<b>EVALUATION</b>				
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	Medium	The report is for an occupational scenario within the scope of the risk evaluation. Not Specific to DIBP.
	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	Process description. Information is qualitative.
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.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	U.S. EPA, (2016). Chemical Data Reporting (CDR): Complete 2016 submissions.			
<b>HERO ID:</b>	7315471			
<b>Conditions of Use:</b>	Manufacture and Import			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
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.			
<b>EVALUATION</b>				
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.
	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.
<b>Overall Quality Determination</b>			<b>High</b>	



<b>Study Citation:</b>	U.S. EPA, (1995). Chapter 4.2: Introduction to surface coating. Compilation of air pollutant emission factors. Volume I: Stationary point and area sources, fifth edition, AP-42.			
<b>HERO ID:</b>	7315820			
<b>Conditions of Use:</b>	processing			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Process description:	Though DIBP is not specifically mentioned, the group of articles provide information on various types of coating on metal and non-mental surfaces. Solvent base surface coating is conceptually a simple process. Solvents used include toluene, xylene, heptane, hexane, and methyl ethyl ketone. The coating solids portion of the formulations consists of elastomers (natural rubber, styrene-butadiene rubber, polyacrylates), tackifying resins (polyterpenes, rosins, petroleum hydrocarbon resins, asphalts), plasticizers (phthalate esters, polybutenes, mineral oil), and fillers (zinc oxide, silica, clay). DIBP is used as a plasticizer. The process of solvent based surface coating includes a continuous roll of backing material (called the web) is unrolled, coated, dried, and rolled again. To initiate the coating process the continuous web material is unwound from its roll. It travels to a coating head, where the solvent base coating formulation is applied. These formulations have specified levels of solvent and coating solids by weight. Solvent base adhesive formulations contain approximately 67 weight percent solvent and 33 weight percent coating solids. The order of application is generally release coat, primer coat (if any), and adhesive coat. A web must always have a release coat before the adhesive can be applied. Primer coats are not required on all products, generally being applied to improve the performance of the adhesive.			
<b>EVALUATION</b>				
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	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	process/facility data	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	report clearly documents its data sources	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	The report provides only limited discussion of the variability and uncertainty in the results.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	U.S. EPA, (1995). Ap-42: Chapter 4.12 - Manufacture of rubber products.			
<b>HERO ID:</b>	7315841			
<b>Conditions of Use:</b>	Manufacture of Rubber Products			
EXTRACTION				
Parameter	Data			
Process description:	Section 4.12.1: The manufacturing of rubber products involves six principal processing steps (mixing, milling, extrusion, calendering, curing, and grinding), with ancillary steps in between. Initially, the raw rubber (natural or synthetic) is mixed with several additives which are chosen based upon the desired properties of the final product. The mixed rubber is often milled and transferred to an extruder where it can be combined with other rubbers. Many rubber products contain synthetic fabric or fibers for strengthening purposes. These fibers are typically coated with mixed rubber using a calender. The extruded rubber and rubber coated materials are then assembled into a final shape and cured. Among the steps in the tire assembly process, described in more detail below, are bead building; cementing and marking; cutting and cooling; tire building; and green tire spraying. It is during the curing process that the rubber vulcanizes (crosslinks), producing the characteristic properties of finished rubber. Once the final product is cured, it is often ground to remove rough surfaces and/or to achieve symmetry. Additional explanation of the stages provided.			
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	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	Metric is not applicable to qualitative process description information.
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	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination			High	

<b>Study Citation:</b>	U.S. EPA, (1992). Generic scenario document for lube oil additives.			
<b>HERO ID:</b>	8726954			
<b>Conditions of Use:</b>	incorporation into formulation, mixture, or reaction product as a fuel additive			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Production, import, or use volume:	1,000,000 kg additive/year			
Process description:	unloading additive, blending additive with base stock to 1%, package product in cans or drums. More detailed description on page 8			
Number of sites:	2 blending sites			
Chemical concentration:	additive manufactured and diluted to 50-90% in mineral oil. 1% additive in lube oil product			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Assessment uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	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	Report is based on data greater than 20 years old (1992) and industry conditions that are expected to be outdated.	
	Metric 5: Sample Size	Low	Sample distribution for concentration characterized by a range with uncertain statistics but PV estimate is characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Medium	Methods, results, and assumptions are clearly documented, but underlying data sources are not fully transparent.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Uncertainty not addressed. Variability addressed by considering multiple additive types.	
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	U.S. EPA, (2016). Federal research action plan on recycled tire crumb used on playing field and playgrounds. Status report.			
<b>HERO ID:</b>	9102524			
<b>Conditions of Use:</b>	Toys, playground, and sporting equipment			
EXTRACTION				
Parameter	Data			
Process description:	Two tire recycling processes, (1) ambient and (2) cryogenic, are used to create tire crumb rubber in the 10- to 20-mesh (0.84- to 2.0-mm) size, which is generally the size used in synthetic turf infill. The ambient process uses granulation or cracker mills to produce tire crumb rubber at room temperature. Cracker mills use revolving rollers with serrations in them to size-reduce the tires. Once the granules are produced, they are fed through screens and sorted to the appropriate size. The cryogenic process uses liquid nitrogen to freeze partially shredded tires, which then are fed into a hammer mill to create tire crumb rubber. Fabric (i.e., polyester, nylon, or other fibers) and steel belt components of the scrap tire are separated in both processes. Fabric is removed from the rubber using air classifiers or vacuums, while the steel is removed using magnetic separators. Gravity separators also can be used to remove contaminant particles, such as rocks, and can aid in the sorting process. Likewise, water can be used for pre-washing to remove gravel and dirt and cooling during the ambient process; otherwise no chemicals are added to the original rubber composition during either process. Following processing, tire crumb rubber typically is placed into one-ton sacks and distributed to fields for spreading. (14/169)			
Number of sites:	Currently, there are between 12,000 and 13,000 synthetic turf recreational fields in the United States, with 1,200 – 1,500 new installations each year. (4/169) There are nine tire crumb rubber producers in the U.S. that produce 95% of the recycled rubber used in synthetic turf. (13/169) There are approximately eight major synthetic field installers in the United States. (15/169)			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	Medium	Data are for phthalate use in toys, playground, and sporting equipment, which can be both a commercial or consumer use.	
	Metric 4: Temporal Representativeness	High	Assessment is based on current industry conditions and data no more than 10 years old.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (ranges, number of sites) but discrete samples not provided and distribution not fully characterized.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Variability is addressed by explaining two turf production processes. Uncertainty isn't addressed in terms of facility information..	
Overall Quality Determination		High		

<b>Study Citation:</b>	U.S. EPA, (2023). AP-42: Chapter 5 - Petroleum industry.			
<b>HERO ID:</b>	9102566			
<b>Conditions of Use:</b>	processing of fuels and related products			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Process description:	Detailed process descriptions for the manufacture and processing of petroleum products, including fuels, are provided in Chapter 5.1. (1/21) Process descriptions on loading and unloading of vessels are provided in Chapter 5.2. (1/17)			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Report uses high quality data from frequently-used sources.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data are from the U.S.	
	Metric 3: Applicability	Medium	Data are for processing of fuels and related products, but are not chemical specific.	
	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 generally more than 10 years but no more than 20 years old.	
	Metric 5: Sample Size	N/A	N/A - This metric is not applicable to the data being extracted	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	All data sources, methods, results, and assumptions are clearly documented.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	N/A	N/A - This metric is not applicable to the data being extracted	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	Velstone International Ltd, (2003). Safety Data Sheet (SDS): Velstone Activator.			
<b>HERO ID:</b>	6302666			
<b>Conditions of Use:</b>	Application of adhesives and sealants			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	30 – 60%			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Medium	From an OECD country (Ireland)
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (adhesives and sealants)
	Metric 4:	Temporal Representativeness	Low	More than 20 years old (2003)
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Velázquez-Gómez, M., Hurtado-Fernández, E., Lacorte, S. (2019). Differential occurrence, profiles and uptake of dust contaminants in the Barcelona urban area. Science of the Total Environment 648:1354-1370.			
<b>HERO ID:</b>	5043338			
<b>Conditions of Use:</b>	Consumer Use - Public Areas			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	DIBP Median dust concentrations: Houses: 7955 ng/g High Schools: 13,726 ng/g Museums: 7241 ng/g Libraries: 14,013 ng/g Cars: 4944 ng/g			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Sampling/analytical methodology is equivalent to an approved [OSHA/NIOSH] method.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Medium	Data are from Spain, an OECD country.	
	Metric 3: Applicability	Medium	Data are for phthalate concentrations in dust for public and private spaces, similar to in-scope occupational scenarios.	
	Metric 4: Temporal Representativeness	High	Monitoring data are no more than 10 years old.	
	Metric 5: Sample Size	Medium	Sample distribution characterized by limited statistics (medians, ranges, maximums, minimums, frequencies) but discrete samples not provided and distribution not fully characterized.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Most critical metadata included.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	High	Uncertainty is addressed in sampling/analytical methodology. Variability is addressed by sampling multiple locations for each different occupational scenario.	
Overall Quality Determination		High		

<b>Study Citation:</b>	Wang, Y., Zhu, H., Kannan, K. (2019). A review of biomonitoring of phthalate exposures. Toxics 7(2):21.		
<b>HERO ID:</b>	5547263		
<b>Conditions of Use:</b>	Use of plastics		
<b>EXTRACTION</b>			
<b>Parameter</b>	<b>Data</b>		
Chemical concentration:	PVC products may contain up to 50% (by weight) phthalates. Food packaging plastic film contains phthalates (such as DBP and DEP) at levels of up to 10% by weight.		
<b>EVALUATION</b>			
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	Low	The report is for a non-occupational scenario that is similar to an occupational scenario within the scope of the risk evaluation, such as a consumer DIY scenario that is similar to a worker scenario.
	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	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 report addresses variability and uncertainty in the results. Uncertainty is well characterized.
<b>Overall Quality Determination</b>		<b>High</b>	



<b>Study Citation:</b>	Wang, Y., Zhu, H., Kannan, K. (2019). A review of biomonitoring of phthalate exposures. Toxics 7(2):21.			
<b>HERO ID:</b>	5547263			
<b>Conditions of Use:</b>	Manufacturing			
EXTRACTION				
Parameter	Data			
Production, import, or use volume:	The annual global production of phthalate was 4.7 million metric tons in 2006 [6,7] and ~8 million metric tons in 2015 [8].			
Life cycle description:	The high molecular weight phthalates are used primarily in PVC polymers and plastisol applications, plastics, food packaging, and food processing materials, vinyl toys and vinyl floor coverings, and building products. The low molecular weight phthalates are often used in non-PVC applications, such as personal care products, paints, adhesives, and enteric-coated tablets [44]. BzBP, DEHP, DiNP, DBP, and DiBP are used in toys, bags, gloves, and plastic tubing for improving flexibility and making the polymeric products soft and malleable [4]. DMP and DEP are widely used in cosmetics, such as perfumes, aftershaves, shampoos, makeup, and nail care products [4].			
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	Low	Global values provided
	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	N/A	Process data
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		

<b>Study Citation:</b>	Wilsonart, (2013). Material Safety Data Sheet (MSDS): Wilsonart® Hard Surface Adhesive.			
<b>HERO ID:</b>	6302668			
<b>Conditions of Use:</b>	Application of adhesives and sealants			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	25 – 50%			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (adhesives and sealants)
	Metric 4:	Temporal Representativeness	Medium	More than 10 but less than 20 years old (2013)
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Wilsonart, (2013). Safety Data Sheet (SDS): Wilsonart® 8215 Adhesive and Activator - SK200.			
<b>HERO ID:</b>	6302669			
<b>Conditions of Use:</b>	Application of adhesives and sealants			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	30 – 60%			
<b>EVALUATION</b>				
Domain	Metric		Rating	Comments
Domain 1: Reliability	Metric 1:	Methodology	High	SDS information is primary data from the supplier. SDS does not appear to have quality issues.
Domain 2: Representativeness	Metric 2:	Geographic Scope	High	Product is from a US supplier.
	Metric 3:	Applicability	High	SDS is applicable to an occupational scenario within the scope of the risk evaluation. (adhesives and sealants)
	Metric 4:	Temporal Representativeness	Medium	More than 10 but less than 20 years old (2013)
	Metric 5:	Sample Size	Medium	Characterized by a range with uncertain statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Low	Source just provides concentration and does not document how this value was obtained.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Medium	Variability addressed by providing a range of potential concentrations. Uncertainty not addressed.
<b>Overall Quality Determination</b>			<b>Medium</b>	

<b>Study Citation:</b>	Yan, Y., Lu, Y., Gao, Y., Wang, B., Zhao, L., Balaram, V., Rambabu, U., Reddy, P., M.R., Munirathnam, N. R., Chatterjee, S. (2018). RoHS regulation: Challenges in the measurement of substances of concern in industrial products by different analytical techniques. Mapan-Journal of Metrology Society of India 33(3):329-346.			
<b>HERO ID:</b>	5043636			
<b>Conditions of Use:</b>	Various commercial/consumer uses.			
EXTRACTION				
<b>Parameter</b>	<b>Data</b>			
Life cycle description:	Table 1 lists potential uses of DIBP after manufacturing and processing - medical devices, monitoring and control instruments, toys and childcare items, furniture, water and air mattresses, rubber footwear, erasing rubber, packaging materials and insulation on wires and cable			
Comments:	Source provides other process descriptions and concentrations for metals such as cadmium, chromium lead and mercury. Mentions specific phthalates such as DIBP but does not provide any quantitative data on any phthalates.			
EVALUATION				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Data is high quality and is peer reviewed.	
Domain 2: Representativeness	Metric 2: Geographic Scope	Low	Data is for India, a non-OECD country	
	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	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	Low	Distribution of samples is qualitative or characterized by no statistics.	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	Low	Report only provides "typical applications" for DiBP	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Low	The report does not address variability or uncertainty.	
Overall Quality Determination		Low		

<b>Study Citation:</b>	Young, A. S., Allen, J. G., Kim, U. J., Seller, S., Webster, T. F., Kannan, K., Ceballos, D. M. (2018). Phthalate and Organophosphate Plasticizers in Nail Polish: Evaluation of Labels and Ingredients. Environmental Science & Technology 52(21):12841-12850. [Environmental science & technology].			
<b>HERO ID:</b>	5164231			
<b>Conditions of Use:</b>	consumer use - personal care products			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	DIBP was detected in all 40 nail polish samples with a median of 0.114 ug/g and range: [0.00300, 0.778] ug/g. Table 4 is a comparison of this study with other similar studies and their maximum concentrations of phthalates.			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1: Methodology	High	Source is peer reviewed and likely would not have any flaws or quality issues.	
Domain 2: Representativeness	Metric 2: Geographic Scope	High	Data is for US	
	Metric 3: Applicability	Low	Data is for a consumer use, personal care products specifically nail polishes.	
	Metric 4: Temporal Representativeness	High	Data is less than 10 years old.	
	Metric 5: Sample Size	Medium	Samples characterized by range with uncertain statistics	
Domain 3: Accessibility/ Clarity	Metric 6: Metadata Completeness	High	Metadata is not for occupational exposure but extensive information is given about sampling.	
Domain 4: Variability and Uncertainty	Metric 7: Metadata Completeness	Medium	Addresses variability by testing across multiple different types of nail polishes. Does not address uncertainty.	
<b>Overall Quality Determination</b>		<b>High</b>		

<b>Study Citation:</b>	Zhang, L.,i, Su, W.,ei, Qian, Y., Zhao, Y., Zhu, Z., Wang, D. (2016). Quantitative detection and impact evaluation of phthalate plasticizers in insulating oil. IEEE Transactions on Dielectrics and Electrical Insulation 23(6):3429-3434.			
<b>HERO ID:</b>	5533553			
<b>Conditions of Use:</b>	Insulating oils in electrical parts (transformers)			
<b>EXTRACTION</b>				
<b>Parameter</b>	<b>Data</b>			
Chemical concentration:	Table 5 gives DIBP concentration in insulating oil samples (mg/L): 7.11, 10.04, 7.74, 8.43, 8.94, 2.63; Table 7 gives other concentrations of seven oil samples: 10.68, 9.66, 1.45, 9.03, 8.27, 9.22, ND			
<b>EVALUATION</b>				
Domain	Metric	Rating	Comments	
Domain 1: Reliability	Metric 1:	Methodology	High	Source is peer reviewed so likely contains high quality data.
Domain 2: Representativeness	Metric 2:	Geographic Scope	Low	Data is from China, a non-OECD country.
	Metric 3:	Applicability	High	Data is applicable to amount of DIBP present in transformer electrical parts.
	Metric 4:	Temporal Representativeness	High	Report is from 2016, less than 10 years old.
	Metric 5:	Sample Size	Low	Characterized by individual samples but not statistics.
Domain 3: Accessibility/ Clarity	Metric 6:	Metadata Completeness	Medium	Documents results, methods and assumptions. Sources are generally described.
Domain 4: Variability and Uncertainty	Metric 7:	Metadata Completeness	Low	Does not address variability or uncertainty.
<b>Overall Quality Determination</b>		<b>Medium</b>		

<b>Study Citation:</b>	Ügdüler, S., Geem, Van, K. M., Roosen, M., Delbeke, P., E.I., Meester, De, S. (2020). Challenges and opportunities of solvent-based additive extraction methods for plastic recycling. Waste Management 104:148-182.		
<b>HERO ID:</b>	7976469		
<b>Conditions of Use:</b>	Plasticizer for Plastics		
EXTRACTION			
<b>Parameter</b>	<b>Data</b>		
Life cycle description:	Plasticizers are used as a lubricant as they decrease the stiffness of the polymer via reduction of the cohesive intermolecular friction along the polymer chain (Subramanian, 2013). They are mostly used for polymers which are in a glassy state at room temperatures such as PVC, and their flexibility is improved via strong interaction between the plasticizer and polymer chain units (Stepek, 1983). In addition, they reduce shear during polymer processing and improve the impact resistance of the final material (Bhunia et al., 2013). (p. 13).		
Chemical concentration:	Plasticizers are typically organic liquids with high molecular weight and boiling point. The used concentration varies between 20 and 50% of the total plastic weight (p. 13).		
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 Belgium, an 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 was published in 2020.
	Metric 5: Sample Size	N/A	Life cycle 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	High	The report addresses variability and uncertainty in the results. Uncertainty is well characterized.
Overall Quality Determination		High	

<b>Study Citation:</b>	Ügdüler, S., Geem, Van, K. M., Roosen, M., Delbeke, P., E.I., Meester, De, S. (2020). Challenges and opportunities of solvent-based additive extraction methods for plastic recycling. Waste Management 104:148-182.		
<b>HERO ID:</b>	7976469		
<b>Conditions of Use:</b>	Plastics Recycling - Solvent Extraction of Plastic Additives		
EXTRACTION			
Parameter	Data		
Process description:	The removal of molecules from a solid matrix is a complex process which is very difficult to model in a proper way as there are many factors that are relevant, ranging from pore size to chemical interactions between solute, solvent and solid matrix. Permeability of the solid matrix is the main physical factor which controls the rate mechanism of mass transport. When a solvent is in contact with the solid matrix, it is likely to percolate through the permeable matrix and remove the substances based on their solubility with a specific rate which is controlled by the diffusivity. Therefore, permeability depends on both solubility and diffusivity (p. 15). See Table 3.1 for summary of extraction methods found for phthalates: methanol ethanol, 2-propanol and acetone/CYHA for extraction of phthalates from PVC had a 71-96% efficiency; methanol extraction of phthalates from PVC had 60-95% efficiency; Sc-CO2 with methanol extraction of phthalates from PVC had a 10-90% efficiency; Sc-CO2 extraction of phthalates from PVC had a 30-98% efficiency; CYHA/2-propanol extraction of phthalates from PVC and PP had a ~100% efficiency; and, THF/ethanol extraction of phthalates from PVC had a >90% efficiency.		
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 Belgium, an 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 was published in 2020.
	Metric 5: Sample Size	N/A	Process extraction 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	Medium	The report provides only limited discussion of the variability and uncertainty in the results.
Overall Quality Determination		High	