SPERC fact sheet – Processing aid/extraction solvent– Industrial (Solvent-borne)

General Information	
Title of Specific ERC	Processing aid/extraction solvent solvent-borne
Applicable ERC	4 – Industrial use of processing aids;
Responsible	ESIG/ESVOC
Version	V1
Code	ESVOC x.x.v1
Scope	Use of a substance as a process chemical or extraction agent. Includes recycling/ recovery, material transfers, storage, maintenance and loading (including marine vessel/barge, road/rail car and bulk container), sampling and associated laboratory activities. *Substance Domain*: Applicable to petroleum substances (e.g., aliphatic and aromatic hydrocarbons) and petrochemicals (e.g., ketones, alcohols, acetates, glycols, glycol ethers, and glycol ether acetates). *Size of installation:* Assumed that 5000 kg/day be used at installation *Processing conditions:* Dry process
Related use descriptors	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)

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	Characteristics of specific ERC	Type of Input Information
Operational Conditions	Indoor use. Process optimized for highly efficient use of raw materials (very minimal environmental release). Volatile compounds subject to air emission controls. Negligible wastewater emissions as process operates without water contact. Negligible air emissions as process operates in a contained system. Wastewater emissions generated from equipment cleaning with water.	
Obligatory onsite RMMs	Emission factors to wastewater are based on water solubility. Assumes no free product in wastewater stream; oil-water (separation (e.g. *via* oil water separators, oil skimmers, dissolved air floatation) may be required under some circumstances	
Substance Use Rate	The substance maximum use rate (M_{SPERC}) is assumed to be 5000 kg/d	Maximum site tonnage, based on sector knowledge*. May overwrite with own use rate.
Days Emitting	300 days/year	Default 'Manufacture' – Tonnage > 10000 tonnes/year. Consider overwriting for own use rate of < 10000 tonnes/year[1]
Environmental Parameters for Fate Calculation	Assumed dilution factor in freshwater is 10. For marine assessments an additional tenfold dilution is assumed, i.e., dilution factor in marine water = 100.	ERC defaults[2]

*Maximum amount of substance that is used on site in one day based on typical site capacity (e.g. 2 trucks each with a volume of 25t)

[1]ECHA Guidance on information requirements and chemical safety assessment, Chapter R.16: Environmental Exposure Estimation, Section R.16.3.2.1

[2]ECHA Guidance on information requirements and chemical safety assessment, Chapter R.16: Environmental Exposure Estimation, Section R.16.6.3
http://guidance.echa.europa.eu/docs/guidance_document/information_requirements_r16_en.pdf

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	Characteristics of Specific ERC		Justification
Emission Fractions (from the process)	***To Air*** VP > 10000 Pa VP 1000-10000 Pa VP 100-1000 Pa VP 10-100 Pa VP 1-10 Pa VP < 1 Pa	***f* (vapor pressure)** 0.05 0.05 0.01 0.001 0.0001 0.00001	EUTGD (2003) Appendix 1[3]
	To Wastewater/Sewer/ Water courses WS < 1 mg/L WS 1-10 mg/L WS 10-100 mg/L WS 100-1000 mg/L WS >1000 mg/L	***f* (water solubility)** 0.00001 0.00003 0.0003 0.003 0.01	Emission factors to wastewater are conservatively calculated from equipment cleaning and substance aqueous solubility *Assumption of 10 m^3 of wastewater generated per 1 tonne of substance is conservative.[4] Example: 1 mg/L x 10 m^3/tonne use x 1000 L/m^3 x 1tonne/10^9mg = 0.00001 tonnes/tonne used. For WS range (e.g., 1-10 mg/L), the geometric mean (i.e., 3.2 mg/L) is used to calculate the fraction released.*
	To Soil	0.0001	ERC1 default[5]

[3]European Commission Technical Guidance Document on Risk Assessment (EUTGD) Part 2 – 2nd Edition (2003). Appendix 1, Table A1.1 (MC=3).
http://ihcp.jrc.ec.europa.eu/our_activities/health-env/risk_assessment_of_Biocides/doc/tgd/tgdpart2_2ed.pdf

[4] The use of solvent as a processing aid/extraction solvent is considered to be linked to the manufacture of substance; therefore the same ratio of water used per tonne of chemical manufactured has been adopted for this use. Data from Ecoinvent 2.0 database suggest water use for manufacturing of 1-butanol[4], 4-methyl-2-pentanone[5] and benzyl alcohol[5] are 1.0, 0.2, 1.5 m^3/tonne solvent, respectively (original reference: *Chauvel A., Lefebvre G. and Castex L. 1986. Proced de Petrochemie. Caracteristiques techniques et economiques. Vol. 2 pp. 96. 2nd Ed. Final report ecoinvent data v2.0. Volume 8. Swiss Centre for LCI, Empa – TSL. Dubendorf, CH.*
[5]Overcash M. 1998-2004. Chemical life cycle database. Chemical and Biomolecular Engineering, North Carolina State University, Raleigh, NC. Final report ecoinvent data v2.0. Volume 22. Swiss Centre for LCI, Empa – TSL. Dubendorf, CH.).
Analysis of 122 refineries included in the Petrorisk model indicates the mean, 90th and 95th percentile of process water to crude oil throughput of 1.9, 3.9 and 12 m3 water /tonne oil. These data, combined with other estimates in the Ecoinvent 2.0 database, ranging from 0.6 – 12 m^3/tonne solvent, support use of the assumed water use value of 10 m^3/tonne.

[5] ECHA Guidance on information requirements and chemical safety assessment, Chapter R.16: Environmental Exposure Estimation, Appendix R.16-1 Environmental Release Categories

	Type of RMM	Typical Efficiency
Appropriate Risk Management Measures (RMM) that may be used to achieve required emission reduction	***Air***	
	On-site Technology Vapor recovery – Adsorption *Other*	90% Default efficiencies of the RMMs according to CEFIC Risk Management Library and [8]*IPPC 2009 draft BREF on Common Waste Water & Waste Gas Treatment/Management Systems in the Chemical Sector*. *A default value of 90% was selected on the basis of expected RMM efficiency consistent with the assumed maximum site tonnage (i.e., 2000 t/d).
	Water	
	Offsite Technology Municipal wastewater treatment plant	The removal efficiency of a sewage treatment plant can be estimated. The standard estimation is via the SimpleTreat module of EUSES or ECETOC TRA. *Specific substance efficiency calculated via SimpleTreat and is assumed to represent default removal efficiency.
	Onsite Technology Acclimated biological treatment *Other*	The efficiency of the RMMs varies dependent on the treatment technology and the properties of the substance. According to CEFIC Risk Management Library onsite RMMs typically provide removal efficiencies in excess of 80%. For readily and inherently biodegradable substances, the removal efficiency for acclimated biological treatment may be significantly higher than SimpleTreat default estimates; thus, SimpleTreat estimates can serve as a conservative lower bound.[9] Substance-specific efficiencies can be considered.

[9] http://www.aromaticsonline.net/Downloads/WWTP.doc

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Narrative Description of Specific ERC
Use of petroleum substances and petrochemicals as processing aids/extraction solvents encompasses a wide range of activities such as material recycling/recovery, transfers, storage, etc. Substance losses to air are reduced through use of general and site-specific risk management measures to maintain workplace concentrations of airborne VOCs and particulates below respective OELs; and through use of closed or covered equipment/processes to minimize evaporative losses of VOCs. Substance losses to wastewater are generally restricted to equipment cleaning, as processes operate without contact with water. Such uses and properties of the substance result in limited to no discharge to wastewater or to soil from the industrial site.

Safe Use

Communication in SDS

The REACH registrant establishes a set of standard conditions of safe use for a substance (for industrial use of a solvent-borne processing aid) by adopting the conditions specified in this SPERC and recommending a Required Removal Efficiency (RRE) for adequate risk reduction. If RRE = 0, wastewater emission controls (beyond those specified by the operational conditions) are not required to ensure safe use of the substance. If > 0, the RRE may be achieved via offsite municipal sewage treatment (providing substance removal efficiency, $RE_{Offsite}$) and/or onsite emission controls (providing substance removal efficiency, RE_{Onsite}). Multiple onsite emission reduction technologies can also be considered, if necessary and applicable (e.g., $RE_{Onsite} = 1 – [(1 – RE_{Onsite, 1}) \times (1 – RE_{Onsite, 2}) \times \text{etc.}]$, where $RE_{Onsite, n}$ represents the substance removal efficiency for each onsite emission reduction technology). For direct comparison to the RRE, a total substance emission reduction efficiency (RE_{Total}) is calculated ($RE_{Total} = 1 – [(1 – RE_{Onsite}) \times (1 – RE_{Offsite})]$. An RE_{Total} < RRE is indicative of the safe use of a substance.

Removal efficiency requirements, as dictated by the assumed operating conditions, are documented in the Chemical Safety Report and communicated in the Safety Data Sheet. All other parameters underlying a substance exposure scenario based on the SPERC 'Manufacture of substance – industrial (solvent-borne)' are implicitly referred to via the reference to this SPERC.

Scaling

Wastewater

Users of hydrocarbon solvents and related petrochemicals are responsible for evaluating compliance of their specific situations with the registrant's information. To enable this evaluation, users need to know the site-specific substance use rate (M_{Site}) and days emitting ($T_{Emission, Site}$), onsite and offsite emission controls and subsequent total substance emission reduction efficiency ($RE_{Total, Site} = 1 – [(1 – RE_{Onsite, Site}) \times (1 – RE_{Offsite, Site})]$), sewage treatment plant effluent flow rate ($G_{Effluent, Site}$) and receiving water dilution factor (q_{Site}). Adequate control of risk exists if the following expression holds true:

for risk driven by wastewater treatment plant microbes

$[M_{SPERC} \times (1 – RE_{Total, SPERC})] / G_{Effluent, SPERC} \geq [M_{Site} \times (1 – RE_{Total, Site})] / G_{Effluent, Site}$

for risk driven by freshwater/freshwater sediments, marine water/marine water sediments

$[M_{SPERC} \times (1 – RE_{Total, SPERC})] / (G_{Effluent, SPERC} \times q_{SPERC}) \geq [M_{Site} \times (1 – RE_{Total, Site})] / (G_{Effluent, Site} \times q_{Site})$

for risk driven by secondary poisoning (freshwater fish/marine top predator) or indirect exposure to humans (oral)
$[M_{SPERC} \times T_{Emission, SPERC} \times (1 - RE_{Total, SPERC})] / (G_{Effluent, SPERC} \times q_{SPERC}) \geq [M_{Site} \times T_{Emission, Site} \times (1 - RE_{Total, Site})] / (G_{Effluent, SpERC} \times q_{Site})$

It is simpler and thus may be preferable to some users to compare M_{Site} with M_{Safe} (*the maximum tonnage that can be safely used, within the prescribed operating conditions, OC_{SpERC} and RMM, $RE_{Total, SpERC}$*). Adequate control of risk exists if the following conditions are met [$RE_{Total, Site} \geq RE_{Total, SPERC}$, $G_{Effluent, Site} \geq G_{Effluent, SPERC}$, and $q_{Site} \geq q_{SPERC}$] and $M_{Safe} \geq M_{Site}$.

Local amount used, emission days per year, receiving water flow rate (or dilution factor), sewage treatment plant effluent flow rate, and risk management measure removal efficiency are the adjustable parameters for emission assessment. These parameters can be refined using site-specific information, which often is obtainable with limited effort and expertise. Adjusting the assessment by refining these parameters is referred to as scaling. Scaling is applied to evaluate compliance of a specific use with a generic Exposure Scenario. For that reason, site parameter values which deviate from the default values need to reflect the actual situation. This may have to be justified on demand.

The release factors are an additional set of adjustable parameters; however, refining the default values requires sufficient justification and, thus, is beyond the boundary conditions defined in the SPERC Factsheet. For that reason, release factor refinements do not constitute a SPERC-based assessment and must be considered an element of downstream user chemical safety assessment.

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ESVOC 1.1.v1

Determinant Label	Quali-/ Quanti-tative	Value	Description of Value	Effectiveness in % (default, min-max) for water and/or air	Exposure route	Use conditions worker	Use conditio consumer
Indoor/Outdoor use	Qual	Indoor use			Air/ water/ soil	e-w-3	e-c-4
Process efficiency	Qual	Process optimized for highly efficient use of raw materials (very minimal environmental release)	-		Water	e-w-3	e-c-4
Equipment cleaning	Qual	No release to wastewater from process as such, wastewater emissions limited to release generated from final equipment cleaning step using water	-		Water	e-w-3	e-c-4
On-site treatment of off-air	Qual	Typical measures to maintain workplace concentrations of airborne VOCs and particulates below respective OELs: e.g. Thermal wet scrubber – gas removal and/or air filtration – particle removal and/or thermal oxidation and/or vapour recovery – adsorption	-		Air	e-w-3	
On site treatment of wastewater	RMM	Acclimated biological treatment	For readily and inherently biodegradable substances, the removal efficiency for acclimated biological treatment may be significantly higher than SimpleTreat estimates; thus, SimpleTreat estimates can serve as a conservative lower bound. Substance-specific efficiencies can be considered and can be used to overwrite the arbitrary default of this determinant value, which is set to 70%	Water 70%	Water	e-w-3	
On-site treatment of off-air	RMM	Vapor recovery (adsorption ..)	A default value of 90% was selected on the basis of expected RMM	Air: 90%	Air	e-w-3	

efficiency consistent with typical vapor collection and recovery systems associated with naphta loading and storage and with the assumed maximum site tonnage (i.e. 2000 t/d)