Cosmetics Europe / AISE SPERC fact sheet – Industrial use in formulation of solid cosmetic and home care products

Section	Content	
SPERC Title	Industrial use in formulation of solid cosmetic and home care products	
SPERC code		
	Cosmetics Europe / AISE 2.3.a.v2 - Formulation of solid cosmetic and home care products (large scale) Cosmetics Europe / AISE 2.3.b.v2 - Formulation of solid cosmetic and home care products (medium scale) Cosmetics Europe / AISE 2.3.c.v2 - Formulation of solid cosmetic and home care products (small scale)	
Scope		
	Covers the whole process of formulation as it occurs in the manufacturing of a solid cosmetic and home care products, e.g. body care soap, scented candles, shoe wax, etc. This includes storing, mixing, packaging of substances (as part of mixtures) and equipment cleaning, maintenance and associated laboratory activities. The SPERCs are relevant for operations which discharge their wastewater to treatment by a municipal sewage treatment plant. The SPERCs cover small, medium and large operations, which produce less than 1000 tons, up to 10,000 tons or more than 10,000 tons of finished products per year, respectively. *Substance Domain:* All (see Narrative Description)	
Related use descriptors		
	Main User Group: SU 3	
	Sector of Use: SU 10	
	Environmental Release Class: ERC 2	
	Process Categories: PROC1, PROC2, PROC3, PROC5, PROC8a, PROC8b, PROC 9, PROC14, PROC 15.	
	Product categories: PC 39	
Operational conditions		***Operational conditions – Phrases***
	Cosmetics Europe / AISE 2.3.a.v2	Process optimized for highly efficient use of raw materials., Indoor Use, Water-Based Process, Process with negligible volatilization
	Cosmetics Europe / AISE 2.3.b.v2	Process optimized for efficient use of raw materials, Indoor Use, Water-Based Process, Process with negligible volatilization

	Cosmetics Europe / AISE 2.3.c.v2	Process with efficient use of raw materials, Indoor Use, Water-Based Process, Process with negligible volatilization	
		Operational conditions - Free text background	
	Cosmetics Europe / AISE 2.3.*a*.v2	General good practice: e.g. trained staff, spill protection including waste reuse. Advanced technology used in process e.g Closed automated process Closed transfer system Centralized process control Reduced emissions to waste water due to e.g.: - Dry cleaning of equipment (Use of absorbent materials including incineration of resulting solid waste) - Cleaning involving so-called pigs, CIP-System, etc. - Steam cleaning - Manual removal of residual products adhering to equipment (e.g. by manual scrubbing, vacuum cleaning, etc.) Reduced number of transfer and cleaning operations through e.g. - Manufacturing of different products from one premix, to which certain ingredients are added to yield the final products. - Dedicated storage tanks for raw materials, premixes and final products	
	Cosmetics Europe / AISE 2.3.b.v2	General good practice: e.g. trained staff, spill protection. Technology used in process e.g Closed batch process Semi Closed transfer system Batch production of final product Reduced number of transfer and cleaning operations through e.g. Dedicated storage tanks for raw materials, and final products	
	Cosmetics Europe / AISE 2.3.c.v2	General good practice: e.g. trained staff, spill protection. Used in process e.g Batch process Batch production of final product	
Obligatory onsite RMMs		***RMM - Phrase***	***RMM-Efficiency (RE_{SPERC})***
	Cosmetics Europe / AISE 2.3.a.v2	No wastewater treatment required.	0
	Cosmetics Europe / AISE 2.3.b.v2		0
	Cosmetics Europe / AISE 2.3.c.v2		0

Substance use rate		***Phrase***	***Value (M_{SPERC})***
	Cosmetics Europe / AISE 2.3.a.v2	Maximum daily site tonnage (kg/day):	16,700
	Cosmetics Europe / AISE 2.3.b.v2		4,500
	Cosmetics Europe / AISE 2.3.c.v2		450
	Justification		
	M_{SPERC} can be used by the registrant when starting the environmental assessment. M_{SPERC}-represents an indicative worst case value for the substance use rate per site. The M_{SPERC} values have been estimated in dependence of the size of the operation, the number of days emitting, and the concentration of the substance in a finished product (i.e. mixture). See M_{SPERC}-derivation in Appendix.		
Days emitting		***Phrase***	***Value (d)***
	Cosmetics Europe / AISE 2.3.a.v2	Emission Days (days/year):	250
	Cosmetics Europe / AISE 2.3.b.v2		250
	Cosmetics Europe / AISE 2.3.c.v2		250

Release factors		***Values (per pathway)***			
		To air	To water	To soil	To waste
	Cosmetics Europe / AISE 2.3.a.v2	0	0.0005	0	0
	Cosmetics Europe / AISE 2.3.b.v2	0	0.001	0	0
	Cosmetics Europe / AISE 2.3.c.v2	0	0.002	0	0
		Justification			
	Releases to Air: Releases of raw materials via volatilization are quantitatively very low. For that reason, the study by Royal Haskoning (2009) does not consider to establish release factors for the use of fragrance materials in the manufacturing of detergent products. For that reason, the release factor is set to zero. Releases to water via wastewater: Releases to the wastewater can be the result of cleaning of mixing vessels, tubing, production/packaging lines with water. The spent cleaning water is discharged to the wastewater. The number for Cosmetics Europe 2.3.a.v2 is equal to that for large production of soap in the study by Royal Haskoning (2009). The Royal Haskoning data for small scale production of soap were adopted (in a conservative approach) for medium scale production according to Cosmetics Europe (Cosmetics Europe / AISE 2.3.b.v2). The number for small scale manufacturing of soaps according to Cosmetics Europe				

<table>
<tr><td></td><td colspan="3">(Cosmetics Europe / AISE 2.3.c.v2) was extrapolated by the Cosmetics Europe and AISE sector expert teams based on the Royal Haskoning (2009) data.

Releases to soil: Must be avoided.
Releases to waste: Not relevant – no obligatory RMM which divert substances to waste.

Royal Haskoning 2009 Review and evaluation of environmental emission scenarios for fragrance materials during compounding of perfume oils and formulation of consumer products (Research Institute for Fragrance Materials Ref.:9S3975.01/R0007/Nijm, 2009).</td></tr>
<tr><td>Optional risk management measures</td><td></td><td>Type of RMM</td><td>Efficiency</td></tr>
<tr><td rowspan="6"></td><td rowspan="6">Cosmetics Europe / AISE 2.3.a.v2
Cosmetics Europe / AISE 2.3.b.v2
Cosmetics Europe / AISE 2.3.c.v2</td><td>- Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of □ (%):</td><td rowspan="6">Efficiency to be specified depending on treatment technology available on site and substance properties.</td></tr>
<tr><td>- If discharging to domestic sewage treatment plant, no onsite wastewater treatment required.</td></tr>
<tr><td>- If discharging to domestic sewage treatment plant, provide the required onsite wastewater removal efficiency of □ (%):</td></tr>
<tr><td>- Typical onsite wastewater treatment technology provides removal efficiency of □ (%):</td></tr>
<tr><td>- Provide onsite wastewater removal efficiency of □ (%):</td></tr>
<tr><td></td><td>Oil/ water separator</td></tr>
<tr><td></td><td colspan="3">Typical emission reducing equipment/procedures in the cosmetic product plants may comprise:
1. Spill protected areas
2. (Dry) cleaning procedures with maximization of waste reuse in the process
3. Collection of spills and handling by an external third party (typically via incineration)
4. On-site physico-chemical pre-treatment of the waste water (e.g. via pH adjustment, flocculation/precipitation, sedimentation)
5. manual removal of residual products adhering to equipment (e.g. by scrubbing, vacuum cleaning, etc.)</td></tr>
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<table>
<tr><td></td><td colspan="3">Handling of the sludge by an external third party (typically via incineration)</td></tr>
<tr><td>Narrative description</td><td colspan="3">Industrial use in formulation of solid cosmetic and home care products</td></tr>
<tr><td></td><td colspan="3">For economic reasons, formulation of mixtures requires minimized losses of raw materials during the mixing and packaging of products. Losses of raw materials via volatilization are negligible. Significant losses to the environment can be the result of cleaning of mixing vessels, tubing, production/packaging lines. High viscosity products adhere more strongly to the walls of mixing vessels, tubing, production/packaging lines. They are less efficiently transferred into the packaging. Hence, emissions caused by equipment cleaning are higher and lower for high and low viscosity products, respectively. These losses occur irrespective of the physical-chemical properties of the substance employed in a cosmetic product. For that reason, this SPERC pertains to all substances.

Technical comments
- Before treatment means: emissions as entering an on-site biological WWTP, or if absent, as leaving the site towards a municipal WWTP.

- It is assumed for simplicity that 1 kg cosmetic product (excl. water) represents ~ 1 kg COD. Actual average value for the chemical ingredients may range from 1-2.

- Emissions to <u>soil or solid waste</u> are not discussed here, as justified in IFRA (2009), these are considered negligible. Emissions to <u>air</u> are discussed above.</td></tr>
<tr><td>Scaling</td><td colspan="3">Scaling options are based on the comparison of the $M_{Safe\ SPERC}$ with M_{Site} and changes due to RMM (RE) and/or dilution situation on site (q and $G_{Effluent}$).</td></tr>
<tr><td></td><td>Scalable parameters</td><td>Parameter description</td><td>Values – SPERC /ES</td></tr>
<tr><td></td><td>$M_{Safe\ SPERC}$, (kg/d)</td><td>Amount which can be safely used based on the SPERC</td><td>M_{Safe} – outcome of chemical safety assessment</td></tr>
<tr><td></td><td>$RE_{Total,\ SPERC}$</td><td>Removal efficiency assumed in the SPERC</td><td>0</td></tr>
<tr><td></td><td>q_{SPERC}</td><td>Factor by which receiving surface water. dilutes the sewage after treatment</td><td>10</td></tr>
<tr><td></td><td>$G_{Effluent,\ SPERC}$ (m^3/d)</td><td>Discharge rate of sewage.</td><td>2,000</td></tr>
<tr><td></td><td></td><td>Scaling condition</td><td></td></tr>
<tr><td></td><td></td><td>risk driven by wastewater treatment plant microbes
$[M_{Safe,SPERC} \times (1 - RE_{Total,\ SPERC})] / G_{Effluent,\ SPERC} \geq [M_{Site} \times (1 - RE_{Total,\ Site})] / G_{Effluent,\ Site}$</td><td></td></tr>
<tr><td></td><td></td><td>risk driven by freshwater/freshwater sediments, marine water/marine water sediments
$[M_{Safe,SPERC} \times (1 - RE_{Total,\ SPERC})] / (G_{Effluent,\ SPERC} \times q_{SPERC}) \geq [M_{Site} \times (1 - RE_{Total,\ Site})] / (G_{Effluent,\ Site} \times q_{Site})$</td><td></td></tr>
</table>

	Site-specific parameters	Parameter description	Values – Site
	$M_{Site,}$ (kg/d)	Amount which is actually used on-site	To be determined by Downstream User
	$RE_{Total, Site}$	Removal efficiency realized through RMMs on site	
	q_{Site}	Factor by which receiving surface water.dilutes the sewage after treatment	
	$G_{Effluent, Site}$	Discharge rate of sewage.	

Appendix: M_{SPERC}-Derivation

M_{SPERC} can be used by the registrant when starting the environmental assessment. M_{SPERC}-represents an indicative worst case value for the substance use rate per site. M_{SPERC} is calculated according to: $\mathbf{M_{SPERC} = M_{Finished} \times C_{SP} \times T_{Emission,SPERC}^{-1}}$ with C_{SP} = Exemplary concentration of substance in finished product, $M_{Finished}$ = the amount of finished product manufactured (per year), $T_{Emission,SPERC}$ = number of days emitting. Typical parameters values are given in Table 1. $M_{Finished}$ - ranges correspond to the tonnage ranges of finished product as defined by Royal Haskoning (2009) for formulators. The $M_{Finished}$ –ranges are to help formulators find out which SPERC is relevant for their operation. M_{SPERC} values in brackets correspond to $M_{Finished}$ production ranges. For M_{SPERC} distinct values founded on expert estimation are provided, since these are recommended as starting values for environmental exposure assessments, provided no better information is available.

Table 1: Derivation of the default substance use rate M_{SPERC} for *use in formulation of solid cosmetic and home care products*. The derivation is based on typical values of the operational conditions for the various applications covered by this SPERC.

SPERC	**Other Operational Conditions – Phrase**	**Operational Conditions – Values for selected parameters expressing the operational conditions for the SPERC 'industrial use – formulation of granular cleaning and maintenance products.**			
		M_{SPERC} (kg/d)	**$T_{Emission,SPERC}$** (days per year)	**$M_{Finished}$** (t/y)	**C_{SP}**
Cosmetics Europe / AISE 2.3.a.v2	Process optimized for highly efficient use of raw materials.	16700 (> 8000)	250*	>10000	20%
Cosmetics Europe / AISE 2.3.b.v2	Process optimized for efficient use of raw materials.	4500 (800-8000)	250*	1000-10000	20%
Cosmetics Europe / AISE 2.3.c.v2	Process with efficient use of raw materials.	450 (<800)	250*	<1000	20%

* $T_{emission\ spERC}$ has been selected according to Royal Haskoning review on large and medium compounders (Royal Haskoning, 2009)

Appendix - Determinant Lists

*SPERC Cosmetics Europe / AISE 2.*3.a.v2: Formulation of solid cosmetic and home care products (large scale)

Determinant Label	Quali-/ Quanti -tative	Value	Description of Value	Standard Phrase	Efficiency -if applicable
Type of Process	Qual	Substance applied in aqueous process solution with negligible volatilization		Product applied in aqueous process solution with negligible volatilization.	
Indoor/outdoor use	Qual	Indoor Use		Indoor	
Equipment cleaning	Qual	Equipment cleaning with minimized emissions to wastewater	Typically implemented measures for reducing emissions to waste water may include: - Dry cleaning of equipment (Use of absorbent materials and vacuum cleaning including incineration of resulting solid waste) - Cleaning involving so-called pigs - Cleaning involving so-called "cleaning in place" (CIP System) - Steam cleaning and/or - Manual removal of residual products adhering to equipment (e.g. by manual scrubbing, vacuum cleaning, etc.) - use of two-liner systems (i.e. single use disposable reactor cover that is incinerated after use as solid waste)	Equipment cleaning with minimized emissions to wastewater	
Process efficiency	Qual	Process optimized for highly efficient use of raw materials (II)	Typical measures may include e.g. - Closed automated process and/or - Closed transfer system and/or - Centralized process control and/or - re-use of process grey water for cleaning	Process optimized for highly efficient use of raw materials.	

- optimized and/or automated systems for the transport and handling of raw materials, that minimize overall exposure levels and incidental spills
- Reduced number of transfer and cleaning operations through e.g.
- Manufacturing of different products from one premix (masterbatch), to which certain ingredients are added to yield the final products.
- Dedicated storage tanks for raw materials, premixes and final products Recovery of materials through e.g.
- Recycling Residues of granular detergents in cleaning steps at packaging or transfer lines into the slurries.

SPERC Cosmetics Europe / AISE 2.3.b.v2: Formulation of solid cosmetic and home care products (medium scale)

Determinant Label	Quali-/ Quanti -tative	Value	Description of Value	Standard Phrase	Efficiency -if applicable
Type of Process	Qual	Substance applied in aqueous process solution with negligible volatilization		Product applied in aqueous process solution with negligible volatilization.	
Indoor/outdoor use	Qual	Indoor Use		Indoor	
Equipment cleaning	Qual	Equipment cleaning with reduced emissions to wastewater	Typically implemented measures for reducing emissions to waste water may include: - Manual removal of residual products adhering to equipment (e.g. by manual scrubbing, vacuum cleaning, etc.) - use of two-liner systems (i.e. single use disposable reactor cover that is incinerated after use as solid waste)	Equipment cleaning with reduced emissions to wastewater	
Process efficiency	Qual	Process optimized for efficient use of raw materials.	Typical measures may include e.g. - Closed batch systems and / or - Semi-closed transfer system and/or - Batch production of final product Reduced number of transfer and cleaning operations through e.g. - Dedicated storage tanks for raw materials, premixes and final products	Process optimized for efficient use of raw materials.	

SPERC Cosmetics Europe / AISE 2.3.c.v2: Formulation of solid cosmetic and home care products (small scale)

Determinant Label	Quali-/ Quanti -tative	Value	Description of Value	Standard Phrase	Efficiency -if applicable
Type of Process	Qual	Substance applied in aqueous process solution with negligible volatilization		Product applied in aqueous process solution with negligible volatilization.	
Indoor/outdoor use	Qual	Indoor Use		Indoor	
Equipment cleaning	Qual	Equipment cleaned with water, washing disposed of with wastewater.		Equipment cleaned with water, washing disposed of with wastewater.	
Process efficiency	Qual	Process with efficient use of raw materials.	Typically implemented measures for reducing emissions to waste water may include: - Closed batch systems	Process with efficient use of raw materials.	