Annex to the safety data sheet (eSDS) **CLEAMEN 420**

Identification of substnce: Suphuric acid; EEC: 016-020-00-8

Date: 09. 06. 2020

Exposure Scenario 5 Use of sulphuric acid in the process of surface treatments, purification and etching

1 Exposure scenario

ES5 for sulphuric acid deals with its use as a metal surface treatment and etching agent. Sulphuric acid is used in this manner to pickle metallic surface prior to electrolysis in order to remove impurities, stains, rust or other inorganic contaminants. Used pickling fluid is generally neutralised and does not have any consumer application. The processes which use sulphuric acid as metallurgical surface treatments are highly specialised and are controlled to limit emissions and environmental exposure. Furthermore waste capture strategies including the use of scrubbers and dedicated effluent treatment facilities are generally employed.

Used descriptors:

SU2a: Mining
SU3: Industrial uses: Uses of substances as such or in preparation at industrial sites
SU14: Manufacture of basic metals, including alloys
SU15: Manufacture of fabricated metal products, except machinery and equipment
SU16: Manufacture of computer, electronic and optical products, electrical equipment

PC14: Metal surface treatment products, including galvanic and electroplating products
PC15: Non-metal-surface treatment products

PROC01: Use in closed process, no likelihood of exposure
PROC02: Use in closed, continuous process with occasional controlled exposure (including sampling and maintenance)
PROC03: Use in closed batch process (synthesis or formulation)
PROC04: Use in batch and other process (synthesis) where opportunity for exposure arises
PROC08a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities
PROC08b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC09: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
PROC13: Treatment of articles by dipping and pouring

ERC06b: Industrial use of reactive processing aids

Description of activities and processes covered in the exposure scenario

For ES5 the utilisation of sulphuric acid in the metallurgical process of surface treatments and etching has a high degree of control and system closure. Generally the treatment process would be continuous with use levels ranging between 50 and 200 tonnes per day in a large facility. Waste and exhaust gasses from the manufacture process would generally be filtered and scrubbed (typically this removes >99% of sulphur oxides that may be present). The gaseous outflow is typically continually analysed for waste gases associated with sulphuric acid use. Because of the conditions involved in the metal treatment processes (and the nature of sulphuric acid and the produced gases) specially trained workers and systems are employed.

Loading and unloading of tankers with sulphuric acid for use as a surface treatment and etching agent is usually performed in the open air. Workers wear protective clothing (face/eye protection, helmet, anti-acid gloves boots and protective overall). A safety shower is required nearby in case of accidental spillage. Gas displacement lines are also used if filling of road tankers takes place under cover.

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2. Operational conditions and risk management measures (workers and environmental)

Operational conditions related to frequency, duration and amount of use

The industrial scale use of sulphuric acid as a metallurgical surface treatment and etching agent is generally a continuous process, running for long periods without interruption, for up to 365 days per year. Operators work a standard shift and normal working week, with surface treatment processes continuing at weekends.

Information type	Data field	Explanation
Use amount per worker [workplace] per day	No data	Worker exposure should be low and controlled
Duration per day at workplace [for one worker]	8hr/d	Standard number of hours in one work day
Frequency at workplace [for one worker]	220 d/year	Standard number of work days / year
Other determinants related to duration, frequency and amount of use	Intermittent contact is expected	These tasks rarely take a full 8hr / day so worst case is assumed.
Annual amount used per site	10,000 t/y	Worst case site
Emission days per site	365 d/y	Estimate number of emission days, based on continuous use

Operational conditions and risk management measures related to product characteristics

Information type	Data field	Explanation
Type of product the information relates to	Substance as such	The product is in liquid form in a sealed tank container.
Physical state of product	Liquid	
Concentration of substance in product	98 %	Concentrated acid. Slightly diluted concentrations may also be used

Remarks or additional information:

Use of sulphuric acid as a metallurgical surface treatment and etching agent involves specialised processes used to etch the surface of produced metals and to remove oxidation and surface contamination. High integrity contained systems are utilised with little or no potential for exposure to workers. Transfer pipelines and vessels are sealed and insulated to prevent losses and exposure. Workers involved in metal surface treatment work are generally separated from the treatment areas and systems with no direct contact to the installations housing the acid material. Workers involved in sampling and/or transfer of materials to road tankers are trained in the procedures and protective equipment is intended to cope with the worst case scenario, in order to minimise exposure and risks.

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Operational conditions related to available dilution capacity and characteristics of exposed humans

Respiration volume and skin contact under conditions of worker uses

Information type	Data field	Explanation
Respiration volume under conditions of use	10m^3/d	Default value for a worker breathing for a 8hrs work day in RIP 3.2
Skin contact area with the substance under conditions of use	480cm^2 (ECETOC default)	Please note that due to the corrosive nature of sulphuric acid dermal exposure is not considered relevant for risk characterisation as it must be prevented in all cases.

Conditions leading to dilution of initial release related to human health

Information type	Data field	Explanation
Room size and ventilation rate	NA	Not relevant as workers work in a control room, with no direct contact to the installations housing the material

Conditions leading to dilution of initial release related to environment

Information type	Data field	Explanation
Discharge volume of sewage treatment plant	2000 m^3/d	EUSES default value for standard local STP
Available river water volume to receive the emissions from a site	20,000 m^3/d	Standard ERC flow rate leading to a 10 fold dilution in receiving waters.

Risk management measures

Exhaust gasses can be filtered and scrubbed; typically this removes >99% of sulphur oxides. As sulphuric acid can be re-used in the surface treatment process acid waste may be returned to the treatment vessels and re-used in certain situations.

Workers involved in use, handing, sampling and transfer of materials are trained in the procedures and protective equipment is intended to cope with the worst case scenario, in order to minimise exposure and risks. This may include chemical resistant clothing, goggles and respiratory equipment where required.

Environmental emissions are limited by designated waste treatment process designed to limit environmental exposure to all relevant compartments. Waste gas emissions are scrubbed and may also then be diverted to the wastewater stream for further treatment. This significantly lessens the possible emission by atmospheric deposition of atmospheric contaminants to soil or surface waters. Liquid wastes are treated (neutralisation to neutral pH) prior to emission to remove any sulphuric acid in the waste water and sludge from the waste water treatment plant is sent for incineration or landfill and is not used for agricultural spreading. This precludes any contamination of soil by sludge spreading. Waste water treatment is usually carried out by neutralisation followed by flocculation or decantation to remove metal contamination that may have been picked up during the etching or surface treatment processes. Downstream treatment may also take place after these procedures.

Risk management measures for industrial site

Information type	Data field	Explanation
Containment and local exhaust ventilation		

Information type	Data field	Explanation
Containment plus good work practice required	Effectiveness: Unknown	Working with sulphuric acid involves, special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in the production and uses of sulphuric acid are usually housed outdoors. Any gas displaced from containers is conducted via pipeline to be processed i.e. removed and scrubbed and /or filtered.
Local exhaust ventilation is not required	Effectiveness : Unknown	Working with sulphuric acid involves special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in the production and uses of sulphuric acid are usually housed outdoors. Any gas displaced from containers is conducted via pipeline to be processed i.e. removed and scrubbed and /or filtered.
Personal protective equipment (PPE)		
Type of PPE (gloves, respirator, face-shield etc)	Effectiveness: Unknown	Working with sulphuric acid involves special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in the production and uses of sulphuric acid are usually housed outdoors. Any gas displaced from containers is conducted via pipeline to be processed i.e. removed and scrubbed and /or filtered. Workers involved in sampling and transfer of materials to road tankers are trained in the procedures and protective equipment is intended to cope with the worst case scenario, in order to minimise exposure and risks.
Other risk management measures related to workers		
No further risk management measures required		
Risk management measures related to environmental emissions from industrial sites		
Onsite pre-treatment of waste water	Chemical pre-treatment or onsite STP.	Waste waters are generally treated on site by chemical and/or biological methods before release to the municipal STP or to the environment.
Recovery of sludge for agriculture or horticulture	No	All sludge is collected and incinerated or sent to landfill.
Resulting fraction of initially applied amount in waste water released from site	Less than 0.01%	In the second tier assessment removal by neutralization has been considered.

3 Exposure estimation

3.1 Workers exposure

An assessment of worker exposure to sulphuric acid used in surface treatments, purification and etchings (ES 5) was carried for processes relevant to this use scenario as identified by PROC codes.

The effects of sulphuric acid following dermal exposures are local irritation and corrosivity of the skin. There is no evidence of systemic effects following dermal exposures to sulphuric acid. Estimates of systemic dermal doses associated with acute/short-term and long-term exposures to sulphuric acid were not therefore derived. The critical effects associated with acute/short-term and chronic inhalation exposures to sulphuric acid are local respiratory irritation and corrosivity. Systemic toxicity is not therefore relevant to the inhalation route of exposure.

The predicted acute/short-term and long-term inhalation exposure concentrations derived using the ART model were not found to exceed the DNEL value for acute local respiratory effects or the DNEL value for long-term local respiratory effects respectively for any of the processes associated with ES 5.

On the basis of the assumptions made in the exposure assessment and this risk characterisation, it can be concluded that inhalation exposures to sulphuric acid that may potentially arise during processes associated with ES 5 do not pose an unacceptable health risk to workers.

Exposure Scenario 13 Use of sulphuric acid in industrial cleaning.

1 Exposure scenario

ES 13 covers the use of sulphuric acid as a component or feedstock in heavy duty industrial cleaners. This use would not be very regular and would generally be used in cases of heavy industrial contamination. Emissions would be directed to the STP. The sulphuric acid present in the cleaner is generally in quite small concentrations and certainly is much less concentrated than in most industrial exposure scenarios.

Short title of the exposure scenario: Sulphuric acid industrial cleaning

Used descriptors:

SU3: Industrial uses: Uses of substances as such or in preparation at industrial sites

PC35: Washing and cleaning products (including solvent based products)

PROC02: Use in closed, continuous process with occasional controlled exposure (including sampling and maintenance)
PROC05: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant con-tact)
PROC08a: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non-dedicated facilities
PROC08b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC09: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
PROC10: Roller application or brushing
PROC13: Treatment of articles by dipping and pouring

ERC08a: Wide dispersive indoor use of processing aids in open systems
ERC08b: Wide dispersive indoor use of reactive substances in open systems

Description of activities and processes covered in the exposure scenario

In cases of heavy industrial contamination spraying of diluted sulphuric acid may be carried out by trained technicians in controlled environments.

2. Operational conditions and risk management measures (workers and environmental)

Operational conditions related to frequency, duration and amount of use

Information type	Data field	Explanation
Use amount per worker [workplace] per day	No data	Sulphuric acid cleaning would not be required regularly. Amounts used would vary by requirements and by facility but would generally be many times less than those involved with industrial processes.

Information type	Data field	Explanation
Duration per day at workplace [for one worker]	8hr/d	Standard number of hours in one work day
Frequency at workplace [for one worker]	220 d/year	Standard number of work days / year
Other determinants related to duration, frequency and amount of use	Intermittent contact is expected	These tasks rarely take a full 8hr / day so worst case is assumed.
Annual amount used per site	5,000 t/y	Worst case site
Emission days per site	365 d/y	Estimate number of emission days, based on wide dispersive uses

Operational conditions and risk management measures related to product characteristics

Information type	Data field	Explanation
Type of product the information relates to	Substance as such	The product is in liquid form in a sealed tank container.
Physical state of product	Liquid	
Concentration of substance in product	10 %	Approximate concentration in cleaning products

Operational conditions related to available dilution capacity and characteristics of exposed humans

Respiration volume and skin contact under conditions of worker uses

Information type	Data field	Explanation
Respiration volume under conditions of use	$10m^3/d$	Default value for a worker breathing for a 8hrs work day in RIP 3.2
Skin contact area with the substance under conditions of use	$480cm^2$ (ECETOC default)	Please note that due to the corrosive nature of sulphuric acid dermal exposure is not considered relevant for risk characterisation as it must be prevented in all cases.

Conditions leading to dilution of initial release related to human health

Information type	Data field	Explanation
Room size and ventilation rate	NA	Sulphuric acid cleaning would not be required regularly and duration of exposure would be short. Amounts used would vary by requirements and by facility but would generally be many times less than those involved with industrial processes.

Conditions leading to dilution of initial release related to environment

Information type	Data field	Explanation
Discharge volume of sewage treatment plant	$2000\ m^3/d$	EUSES default value for standard local STP

Information type	Data field	Explanation
Available river water volume to receive the emissions from a site	20,000 m^3/d	Standard ERC flow rate leading to a 10 fold dilution in receiving waters.

As the amounts used are low and pre-diluted dilution in the waste stream is expected to be significant. There is no exposure to downstream users or consumers.

Risk management measures

Exhaust gasses may be removed by LEV. Workers involved in using sulphuric acid in industrial cleaning applications are trained in the procedures and protective equipment is intended to cope with the worst case scenario, in order to minimise exposure and risks. Waste stream treatment may also be employed to reduce environmental exposure however for this wide dispersive use particular risk management measures are not needed to demonstrate environmental safe use.

Risk management measures for industrial site

Information type	Data field	Explanation
Containment and local exhaust ventilation		
Containment plus good work practice required	Effectiveness: Unknown	Use of sulphuric acid involves special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in uses of sulphuric acid are usually housed outdoors. Any gas displaced from containers is conducted via pipeline to be processed i.e. removed and scrubbed and /or filtered.
Local exhaust ventilation is not required	Effectiveness : Unknown	Use of sulphuric acid involves special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in uses of sulphuric acid are usually housed outdoors. Any gas displaced from containers is conducted via pipeline to be processed i.e. removed and scrubbed and /or filtered.
Personal protective equipment (PPE)		
Type of PPE (gloves, respirator, face-shield etc)	Effectiveness: Unknown	Use of sulphuric acid involves special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in uses of sulphuric acid are usually housed outdoors. Any gas displaced from containers is conducted via pipeline to be processed i.e. removed and scrubbed and /or filtered. Workers involved in sampling and transfer of materials to road tankers are trained in the procedures and protective equipment is intended to cope with the worst case scenario, in order to minimise exposure and risks.
Other risk management measures related to workers		
No further risk management measures required		
Risk management measures related to environmental emissions from industrial sites		
Onsite pre-treatment of waste water	Chemical pre-treatment or onsite STP.	Waste waters are generally treated on site by chemical and/or biological methods before release to the municipal STP or to the environment.
Recovery of sludge for agriculture or horticulture	No	All sludge is collected and incinerated or sent to landfill.
Resulting fraction of initially	Less than 0.01%	In the second tier assessment removal by neutralization has

Information type	Data field	Explanation
applied amount in waste water released from site		been considered.

3 Exposure estimation

3.1 Workers exposure

An assessment of worker exposure to sulphuric acid used in industrial cleaning (ES 13) was carried for processes relevant to this use scenario as identified by PROC codes.

The effects of sulphuric acid following dermal exposures are local irritation and corrosivity of the skin. There is no evidence of systemic effects following dermal exposures to sulphuric acid. Estimates of systemic dermal doses associated with acute/short-term and long-term exposures to sulphuric acid were not therefore derived. The critical effects associated with acute/short-term and chronic inhalation exposures to sulphuric acid are local respiratory irritation and corrosivity. Systemic toxicity is not therefore relevant to the inhalation route of exposure.

The predicted acute/short-term and long-term inhalation exposure concentrations derived using the ART model were not found to exceed the DNEL value for acute local respiratory effects or the DNEL value for long-term local respiratory effects respectively for any of the processes associated with ES 13. On the basis of the assumptions made in the exposure assessment and this risk characterisation, it can be concluded that inhalation exposures to sulphuric acid that may potentially arise during processes associated with ES 13 do not pose an unacceptable health risk to workers.

Quantitative risk characterisation for workers (ECETOC and ART model)

	Route	**PROC Code**	ES 12- **90th exposure concentrations (mg/m^3)**	**Leading toxic end point / Critical effect**	**DNEL (mg/m^3)**	**Risk characterisation ratio**
Acute-local effects	Inhalation	2	5.5×10^{-4}	Respiratory irritation and corrositivity	0.1	5.5×10^{-3}
		5	6.1×10^{-2}	Respiratory irritation and corrositivity	0.1	6.1×10^{-1}
		8a	5.5×10^{-3}	Respiratory irritation and corrositivity	0.1	5.5×10^{-2}
		8b	5.5×10^{-3}	Respiratory irritation and corrositivity	0.1	5.5×10^{-2}
		9	5.5×10^{-3}	Respiratory irritation and corrositivity	0.1	5.5×10^{-2}
		10	6.1×10^{-1} (3×10^{-2})*	Respiratory irritation and corrositivity	0.1	6.1×10^{0} (3×10^{-1})*
		13	6.1×10^{-3}	Respiratory irritation and corrositivity	0.1	6.1×10^{-2}
Long-term – local effects	Inhalation	2	4.8×10^{-4}	Respiratory irritation and corrositivity	0.05	9.6×10^{-3}
		5	5.3×10^{-2} (2.7×10^{-3})*	Respiratory irritation and corrositivity	0.05	1.1×10^{0} (5.3×10^{-2})*
		8a	4.8×10^{-3}	Respiratory irritation and corrositivity	0.05	9.6×10^{-2}
		8b	4.8×10^{-3}	Respiratory irritation and corrositivity	0.05	9.6×10^{-2}
		9	4.8×10^{-3}	Respiratory irritation and corrositivity	0.05	9.6×10^{-2}
		10	5.3×10^{-1} (2.7×10^{-2})*	Respiratory irritation and corrositivity	0.05	1.1×10^{1} (0.54)*

	Route	**PROC Code**	ES 12- **90th exposure concentrations (mg/m^3)**	**Leading toxic end point / Critical effect**	**DNEL (mg/m^3)**	**Risk characterisation ratio**
		13	5.3 x 10^{-3}	Respiratory irritation and corrositivity	0.05	1.1 x 10^{-1}

*Assumes Respiratory Protective Equipment (95% reduction) is worn

Consumers

As discussed in section 9.1.2.2 consumers are not directly exposed to sulphuric acid, as it is either wholly consumed as an intermediate or processing aid, or if present in an article (such as a battery) is sealed and not designed for release. As such no consumer risk characterization is required. For this exposure scenario the leaning processes are industrial and no consumer release is made.

Indirect exposure of humans via the environment

Environmental releases are shown to be minimal (see below). Sulphuric acid is readily degradable in atmospheric, aquatic and soil compartments, and does not bioaccumulate. Removal by hydrolysis and by the STP is effective. Therefore it is considered unlikely that humans will be exposed indirectly either by way of contact with the air, surface waters or soils, or by way of drinking water, or through exposure in the food chain.

3.2 Environmental exposure

For the tier 1 risk characterisation PECs derived using the ERC defaults are assessed. For the tier 2 risk characterisation the PECs calculated by EUSES with refined inputs taking into account the emission RMMs used to control environmental releases are used for the assessment.

Aquatic compartment (including sediment and secondary poisoning)

Risk characterisation for the aquatic compartment (modeled by EUSES)

Compartments	**PEC mg/L**	**PNEC mg/L**	**PEC/PNEC**	**Comments**
ERC 8A Tier 1 Freshwater	1.34×10^{-4}	0.0025	0.0536	Safe use in tier 1 for all compartments
ERC 8A Tier 1 Sediment	2.67×10^{-5}	0.002 (EPM)	0.013	
ERC 8A Tier 1 Marine sediment	6.04×10^{-6}	0.002 (EPM)	0.003	
ERC 8A Tier 1 Marine	1.08×10^{-4}	0.00025	0.43	
ERC 8B Tier 1 Freshwater	2.21×10^{-6}	0.0025	8.8×10^{-4}	Safe use in tier 1 for all compartments
ERC 8BTier 1 Sediment	1.7×10^{-6}	0.002 (EPM)	8.5×10^{-4}	
ERC 8BTier 1 Marine sediment	5.54×10^{-8}	0.002 (EPM)	2.7×10^{-5}	
ERC 8BTier 1 Marine	5.54×10^{-8}	0.00025	2.1×10^{-4}	

Terrestrial compartment (including secondary poisoning)

Sulphuric acid is used in to clean industrial facilities which may have dedicated effluent treatment facilities, involving both chemical and biological treatment, coping with many chemical substances. There is therefore no direct exposure of soils, and no risk of contamination of groundwater (or of waters extracted from underground for drinking water), or via soils of crops or animals used in food production. Equally, wildlife will not be exposed via the soil or groundwater, and there is no potential for accumulation (secondary poisoning) through the wildlife food chain. Given this lack of expected exposure and the fact that no terrestrial toxicity studies are available for sulphuric acid no PNEC has been derived for the soil compartment and so no risk characterisation is required. In the case of this exposure scenario the wide dispersive nature of the scenario will mean that the emission dilutions are very large and will not be concentrated or will persist in the environment.

Atmospheric compartment

Atmospheric contamination is minimal, with either the use of sealed systems or the use of scrubbers. Given that any sulphuric acid present in the atmosphere will be hydrolysed on contact with moisture any sulphuric acid incident on soils as a result of precipitation will be very dilute, and will be rapidly broken down. No atmospheric PNECs are derived and no atmospheric risk characterisation is required.

4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Occupational exposure

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. This has to be done by showing that they limit the inhalation exposure to a level below the DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as ECETOC TRA or MEASE to estimate the associated exposure.

Environmental emissions

If a DU has OC (operational conditions)/RMMs outside the OC/RMM specifications in the ES, then the DU can evaluate whether he works inside the boundaries set by the ES through scaling. The Metal EUSES calculator for DUs can be freely downloaded from http://www.arche-consulting.be/Metal-CSA-toolbox/du-scaling-tool
In the registrant-interface, the generic default OCs and RMMs can be entered.
The metal box can be left blank. 0 can be filled in for all partition coefficients and PECs regional. Removal rate of municipal STP is 0.99.

Quantitative risk characterisation for workers (ECETOC TRA and ART model)

	Route	**PROC Code**	**ES 1- 90th exposure concentrations (mg/m^3)**	**Leading toxic end point / Critical effect**	**DNEL (mg/m^3)**	**Risk characterisation ratio**
Acute-local effects	Inhalation	PROC 1	9.3×10^{-9}	Respiratory irritation and corrositivity	0.1	9.3×10^{-8}
		PROC 2	9.2×10^{-8}	Respiratory irritation and corrositivity	0.1	9.2×10^{-7}
		PROC 3	4.2×10^{-4}	Respiratory irritation and corrositivity	0.1	4.2×10^{-3}
		PROC 4	1.4×10^{-2}	Respiratory irritation and corrositivity	0.1	1.4×10^{-1}
		PROC 8a	2.3×10^{-2}	Respiratory irritation and corrositivity	0.1	2.3×10^{-1}
		PROC 8b	1.2×10^{-4}	Respiratory irritation and corrositivity	0.1	1.2×10^{-3}
		PROC 9	3.2×10^{-3}	Respiratory irritation and corrositivity	0.1	3.2×10^{-2}
		PROC 13	1.8×10^{-2}	Respiratory irritation and corrositivity	0.1	1.8×10^{-1}
Long-term – local effects	Inhalation	PROC 1	9.4×10^{-9}	Respiratory irritation and corrositivity	0.05	8.4×10^{-3}
		PROC 2	9.2×10^{-8}	Respiratory irritation and corrositivity	0.05	2.8×10^{-1}
		PROC 3	4.2×10^{-4}	Respiratory irritation and corrositivity	0.05	4.6×10^{-1}
		PROC 4	1.4×10^{-2}	Respiratory irritation and corrositivity	0.05	9.6×10^{-5}
		PROC 8a	2.3×10^{-2}	Respiratory irritation and corrositivity	0.05	5.6×10^{-2}
		PROC 8b	4.8×10^{-6}	Respiratory irritation and corrositivity	0.05	3.2×10^{-1}
		PROC 9	2.8×10^{-3}	Respiratory	0.05	8.4×10^{-3}

	Route	PROC Code	ES 1- 90th exposure concentrations (mg/m^3)	Leading toxic end point / Critical effect	DNEL (mg/m^3)	Risk characterisation ratio
				irritation and corrositivity		
		PROC 13	1.6 x 10^{-2}	Respiratory irritation and corrositivity	0.05	2.8 x 10^{-1}

Consumers

As discussed in section 9.1.2.2 consumers are not directly exposed to sulphuric acid, as it is either wholly consumed as an intermediate or processing aid, or if present in an article (such as a battery) is sealed and not designed for release. As such no consumer risk characterization is required.

Indirect exposure of humans via the environment

Environmental releases are shown to be minimal (see below). Sulphuric acid is readily degradable in atmospheric, aquatic and soil compartments, and does not bioaccumulate. Removal by hydrolysis and by the STP is effective. Therefore it is considered unlikely that humans will be exposed indirectly either by way of contact with the air, surface waters or soils, or by way of drinking water, or through exposure in the food chain.

3.2 Environmental exposure

For the tier 1 risk characterisation PECs derived using the ERC defaults are assessed. For the tier 2 risk characterisation the PECs calculated by EUSES with refined inputs taking into account the emission RMMs used to control environmental releases are used for the assessment.

Aquatic compartment (including sediment and secondary poisoning)

As noted previously, sulphuric acid is used in surface treatments purification and etching on a large scale, generally on major chemical sites, which may have dedicated effluent treatment facilities, involving both chemical and biological treatment, coping with many chemical substances. As such the modelled risk characterisation below is very much worst case and actual contamination of the aquatic compartment is expected to be minimal. For Tier 1 the worst case PEC values covering all ERC`s as determined by EUSES are presented below. PNEC sediment values are those as calculated by the equilibrium partitioning method (EPM) in EUSES.

Risk characterisation for the aquatic compartment

Compartments	PEC mg/L	PNEC mg/L	PEC/PNEC	Comments
Tier 2 Freshwater	5.9×10^{-7}	0.0025	2.3×10^{-4}	Safe use demonstrated in tier 2
Tier 2 Sediment	4.75×10^{-7}	0.002 (EPM)	2.35×10^{-4}	Safe use demonstrated in tier 2
Tier 2 Marine sediment	3×10^{-9}	0.002 (EPM)	1×10^{-6}	Safe use demonstrated in tier 2
Tier 2 Marine	8.56×10^{-8}	0.00025	3.4×10^{-5}	Safe use demonstrated in tier 2

Terrestrial compartment (including secondary poisoning)

Sulphuric acid is produced on a large scale, generally on major chemical sites, which may have dedicated effluent treatment facilities, involving both chemical and biological treatment, coping with many chemical substances. There is therefore no direct exposure of soils, and no risk of contamination of groundwater (or of waters extracted from underground for drinking water), or via soils of crops or animals used in food production. Equally, wildlife will not be exposed via the soil or groundwater, and there is no potential for accumulation (secondary poisoning) through the wildlife food chain. Given this lack of expected exposure and the fact that no terrestrial toxicity studies are available for sulphuric acid no PNEC has been derived for the soil compartment and so no risk characterisation is required.

Atmospheric compartment

Atmospheric contamination is minimal, with either the use of sealed systems or the use of scrubbers. Given that any sulphuric acid present in the atmosphere will be hydrolysed on contact with moisture any sulphuric acid incident on soils as a result of precipitation will be very dilute, and will be rapidly broken down. No atmospheric PNECs are derived and no atmospheric risk characterisation is required.

4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Occupational exposure

The DU works inside the boundaries set by the ES if either the proposed risk management measures as described above are met or the downstream user can demonstrate on his own that his operational conditions and implemented risk management measures are adequate. This has to be done by showing that they limit the inhalation exposure to a level below the DNEL (given that the processes and activities in question are covered by the PROCs listed above) as given below. If measured data are not available, the DU may make use of an appropriate scaling tool such as ECETOC TRA or MEASE to estimate the associated exposure.

Environmental emissions

If a DU has OC (operational conditions)/RMMs outside the OC/RMM specifications in the ES, then the DU can evaluate whether he works inside the boundaries set by the ES through scaling. The Metal EUSES calculator for DUs can be freely downloaded from http://www.arche-consulting.be/Metal-CSA-toolbox/du-scaling-tool
In the registrant-interface, the generic default OCs and RMMs can be entered.

The metal box can be left blank. 0 can be filled in for all partition coefficients and PECs regional. Removal rate of municipal STP is 0.99.