

OLEUM

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1.4 Emergency number

Italy: Poisons Information (24 h).

Ospedale Niguarda Milano Tel: +39 02 66101029

CAV Pavia: Tel.+39 0382/24444

CAV Bergamo: Tel: +39 800 883300

CAV Foggia: Tel +39 0881-732326

CAV Firenze: Tel +39 055-7947819

CAV Policlinico Umberto I Roma: Tel +39 06-490663

CAV Policlinico "A.Gemelli": Tel +39 06-3054343

CAV Cardarelli Napoli: Tel: +39 081-5453333/7472870

Foreign countries: Contact the closest Poisons Information Centre.

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Skin Corr 1A; H314

STOT SE 3; H335

2.2 Label elements



GHS05

GH07

Signal Word: **Dangerous**

Hazard Statement: H314 Causes severe skin burns and eye damage.
H335 May cause respiratory irritation
EUH014 Reacts violently with water

Precautionary Statement

Prevention

P280: Wear protective gloves/protective clothing/eye protection/face protection

Reaction

P310: Immediately call a POISON CENTER or doctor/physician.

P305 + P351 + P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

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P303 + P361 + P353: IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.

Conservation

P405: Store locked up.

P501: Dispose of contents/container in accordance with local/regional/national regulations

Note B

2.3 Other hazards

Highly water reactive. Never add water to the product.

3. Composition/information on ingredients

3.1 Substances

Not applicable

3.2 Mixtures

Name	Concentration %	CAS	CE	Index	Registration	Reg. (CE) 1272/2008 (CLP)
Sulfuric acid	71%<C<80%.	7664-93-9	231-639-5	016-020-00-8	01-2119458838-20-0087	Skin Corr 1A;H314
Sulfuric trioxide	20%<C<29%	7664-11-9	231-197-3	n.a.	01-2119458835-26-0026	Skin Corr 1A; H314 STOT SE 3;H335 EUH014

4. First aid measures

4.1 Description of first aid measures

- Eye contact: Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Seek immediate medical attention.
- Skin contact: Get medical attention immediately. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse.
- Swallowing: Wash out mouth with water. In the event of swallowing, induce patient to drink plenty of water. Get medical attention immediately
- Inhalation: Get medical attention immediately. Move exposed person to fresh air. If it is suspected that fumes are still present, the rescuer should wear an appropriate

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mask or self-contained breathing apparatus. Keep person warm and at rest. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

4.2 Most important symptoms and effects, both acute and delayed

The product seriously damages mucous membranes and upper respiratory tract, not only but also eyes and skin. Symptoms are: cough, shortness of breath, headache, nausea. After ingestion: hard pain (risk of stomach perforation!), nausea, vomiting and diarrhea. After a latency period of several weeks possibly pyloric stenosis.

4.3 Indication of any immediate medical attention and special treatment needed

Seek immediately medical attention in all cases of exposure.

5. Firefighting measures

5.1 Suitable extinguishing media

The product is not flammable. Consider materials in the surrounding.

Unsuitable extinguishing media: in case of fire with spilled product does not use water.

5.2 Special hazards arising from the substance or mixture

Decomposition products may include sulfur oxides.

5.3 Advice for firefighters

Do not enter the water in the containers. Provide the emergency workers of appropriate protective clothing and breathing apparatus (SCBA) with forced ventilation full face mask. The product is not flammable, but may react on contact with combustible materials releasing sufficient heat of hydration to cause a trigger. In case of fire or overheating may cause a rise in pressure, use water spray to cool containers exposed to fire.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Do not perform any action if it involves any personal risk or without a suitable training. Move away unnecessary personnel and unprotected. Do not make touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation in enclosed areas. Wear appropriate personal protective equipment (see section 8).

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6.2 Environmental precautions

Avoid dispersal of spilled material and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

6.3 Methods and material for containment and cleaning up

Large spill : Stop leak if without risk. Move containers from spill area. Prevent entry into sewers, water courses, basements or confined areas. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Do not absorb the product with sawdust or other combustible substance. The spilled material may be neutralized with sodium carbonate, sodium bicarbonate or sodium hydroxide. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Small spill : Stop leak if without risk. Move containers from spill area. Absorb with an inert dry material (do not absorb the product with sawdust or other combustible substance) and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

6.4 Reference to other sections

For more information on protective equipment, see section 8.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

7.1.1 Protective measures

Wear appropriate personal protective equipment. If during normal use of the material a respiratory hazard occurs, use adequate ventilation or wear appropriate respirator.

Store in the original container or an approved alternative one made from a compatible material, kept tightly closed and upright when not in use. Keep away from alkalis. Empty containers retain product residues and can be dangerous.

7.1.2 Advice on general occupational hygiene

It is forbidden eating, drinking or smoking in areas where material is handled, stored or processed. Workers must wash hands and face before eating, drinking and smoking. Avoid contact with eyes, skin or clothing. Do not breathe vapor or mist. Do not swallow.

7.2 Conditions for safe storage, including any incompatibilities

Store according to regulations. Store in original container protected from direct sunlight in a dry, cool and well ventilated area away from incompatible materials (see section 10) and food and drink. Keep away from alkalis. Keep container tightly closed and sealed until use. Opened containers must be carefully resealed and kept upright to

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prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Storage temperature preferably between 15 and 25 ° C.

7.3 Specific end uses

See exposure scenarios attached.

8. Exposure controls/personal protection

8.1 Control parameters

ACGIH 2018:

Sulfuric acid,

TLV – TWA = 0.2 mg/m³

substance ACGIH A2, suspected human carcinogen, A2 classification refers to sulfuric acid contained in strong inorganic acid mists.

DIR 2009/161/UE:

TWA = 0.05 mg/m³

Sulfuric trioxide

No occupational exposure limit for this substance.

Monitoring procedures: Refer to the DIR 98/24/CE.

DNEL (Derived No Effect Level)

Sulfuric acid:

Route	DNEL Workers				DNEL general population			
	Long-term, local effects	Long-term, systemic effects	Acute, local effects	Acute, systemic effects	Long-term, local effects	Long-term, systemic effects	Acute, local effects	Acute, systemic effects
oral	Not derived	Not derived	Not derived	Not derived	Not derived	Not derived	Not derived	Not derived
dermal	Not derived	Not derived	Not derived	Not derived	Not derived	Not derived	Not derived	Not derived
Inhalation	0.05 mg/m ³	Not derived	0.1 mg/m ³	Not derived	Not derived	Not derived	Not derived	Not derived

DMEL (Derived Minimal Effect Level), sulfuric acid, sulfuric trioxide not derived

PNECs, sulfuric acid and sulfuric trioxide:

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PNEC(S) (Predicted No Effect Concentration) PNEC freshwater: 0.0025 mg/l
 PNEC aqua marine water: 0.00025 mg/l
 PNEC sediment: $2 \cdot 10^{-3}$ mg/kg wwt
 PNEC sediment marine water: $2 \cdot 10^{-3}$ mg/kg wwt
 PNEC sewage treatment plant: 8.8 mg/l

8.2 Exposure controls

8.2.1 Appropriate engineering controls

The mixture generate fumes, vapors or mist, working outdoors or in ventilated areas of extraction. Implement appropriate technical and engineering measures to maintain worker exposure to airborne contaminants, below any limit value recommended or required by law.

Predict the presence of showers and eyewash fountains in the workplace.

8.2.2 Individual protection measures, such as personal protective equipment

- (a) Eye/face protection: Wear splash shield or full face mask with acid vapors filter.
- (b) Skin protection:
 - i) Hand protection: neoprene gloves
 - ii) Other: In case of possibility of accidental contact with the liquid use antacid overalls and boots.
- (c) Respiratory protection: wear full face mask with filter respirator for acid vapors or self contained breathing apparatus
- (d) Thermal hazards: not applicable



8.2.3 Environmental exposure controls

Provide all technical precautions to avoid the dispersion of material in the surrounding environment.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance	Viscous liquid, colorless to dark brown
b) Odor:	Pungent
c) Odor threshold	Not available
d) pH	<1
e) Melting point/freezing point	Oleum 7 °C (101%); -10 °C (103,5%), 24 °C (107%)

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f) Initial boiling point and boiling range	Oleum 150 °C (103%); 105 °C (108%) Sulfuric acid: 310-335 °C Sulfuric trioxide: 16,8 °C
g) Flash point	Not applicable, mixture of inorganic substance
h) Evaporation rate	Not available
i) Flammability (solid, gas)	Not applicable
j) Upper/lower flammability or explosive limits	Not available The H ₂ SO ₄ is not considered to be explosive on a historical basis (user experience) and on the basis of a theoretical assessment of the structure. The substance is an inorganic acid that contains no chemical groups associated with explosive properties.
k) Vapor pressure	Oleum: 7 mmHg at 20°C Sulfuric acid: 6 Pa at 20 ° C (aqueous solution 90%) Sulfuric trioxide: from 97.3 to 577.2 hPa at 25 °C (according to the polymeric form)
l) Vapor density	Not available
m) Relative density	Oleum: 1.94 g/cm ³ at 20°C Sulfuric acid: 1.8361 kg/l Sulfuric trioxide: 1.9224 g/cm ³ at 20 °C (gamma phase)
n) Solubility(ies)	Miscible in water in all proportions Miscible in inorganic solvent
o) Partition coefficient: n-octanol/water	Not applicable (Not relevant for ionisable substances)
p) Auto-ignition temperature	Not applicable (Non-combustible)
q) Decomposition temperature	340 °C
r) Viscosity	Oleum: 21.6 mPa.s Sulfuric acid: 22.5 cP (H ₂ SO ₄ 95%) Sulfuric trioxide: not applicable, reacts with atmospheric moisture
s) Explosive properties	Not applicable Sulfuric acid is not considered to be explosive on a historical basis (user experience) and on the basis of a theoretical assessment of the structure. The substance is an inorganic acid that contains no chemical groups associated with explosive properties
t) Oxidising properties	The component of the mixture are strong oxidant

9.2 Other information

Sulfuric acid: dissociation constant: pKa 1.92

10. STABILITY AND REACTIVITY

10.1 Reactivity

The mixture does not present additional dangers of reactivity than those reported in the next subtitle.

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10.2 Chemical stability

The product is stable.

10.3 Possibility of hazardous reactions

Will not occur under normal conditions of storage and use

10.4 Conditions to avoid

Highly reactive with water and alkali. Avoid heating

10.5 Incompatible materials

Alkali, metal alkaline, compound alkaline earth metals, bases, acids, metal alloys

Attacks many metals, producing hydrogen (highly flammable) may form explosive mixtures with air. Alkali.

10.6 Hazardous decomposition products

The product decomposes at 340°C producing toxic and corrosive fumes including sulfur oxides.

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicokinetics, metabolism and distribution

The effects of sulfuric acid are essentially the result of the hydrogen ion (local deposition of H⁺, pH change) rather than an effect of the sulphate ion. Sulfuric acid (as such) is not expected to be absorbed or distributed throughout the body as the acid will rapidly dissociate with the hydrogen ion being responsible for the local toxicity (irritation and corrosivity).

The sulfuric trioxide is an anhydride of sulfuric acid and reacts rapidly with moisture to produce sulfuric acid, therefore the kinetics of both substance is the same

11.2 Information on toxicological effects

a) Acute toxicity:

Oral

Based on the results of the study of acute oral toxicity, there is no classification for acute oral toxicity according to EU criteria.

The results of experimental studies are summarized in the following table:

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Method	Results	Remarks	Reference
RAT ORAL (gavage) OECD Guideline 401 (Acute Oral Toxicity)	LD50: 2140 mg/kg (male/female)	Studio chiave	Smyth HF jr, Carpenter CP, Weil CS, Pozzani UC, Striegel JA & Nycum JS (1969) OECD (2001a)

Inhalation

Although the LC50 by inhalation of various studies carried out with sulfuric acid, theoretically leading to classification with CLP as Acute Tox 3 H331 'Toxic by inhalation', this classification is not made because the effects of acid sulfuric following inhalation are related to local irritation of the respiratory system (limited to the site of contact) and there is no evidence for systemic toxicity of sulfuric acid.

The following is a summary of the study more representative of the registration dossier on sulfuric acid

Method	Results	Remarks	Reference
RAT AEROSOL OECD Guideline 403	LC50 375 mg/m ³ (male/female)	key study	Runkle BK & Hahn FF (1976)
TOPO AEROSOL OECD Guideline 403	LC50 0.85 mg/l/4 ore (male/female) LC50 0.6 mg/l/8 ore (male/female)	key study	Runkle BK & Hahn FF (1976)

Dermal

No data on acute dermal toxicity in animals are available. Although this is a potential route of exposure for workers, testing is not justified for scientific reasons and on animal welfare grounds. The effects of acute dermal exposure to sulfuric acid on animals can be readily predicted, and the data from human exposure are sufficient to characterise the effects.

No classification is proposed for the acute dermal toxicity in the absence of a proper study, the acute dermal toxicity of oleum is bound to local irritation and corrosion and is adequately expressed by the classification in CLP as Skin Corr 1A H314 (Causes severe skin burns and eye damage).

b) Skin corrosion/irritation

The oleum is listed in CLP as Skin Corr 1A H314 (Causes severe skin burns and eye damage). Studies of skin irritation / corrosion are therefore not scientifically justified for reasons of animal protection.

c) Serious eye damage/irritation

Sulfuric acid is listed in CLP as Skin Corr 1A H314 (Causes severe skin burns and eye damage). Eye irritation studies are therefore not scientifically justified for reasons of animal protection.

d) Respiratory or skin sensitisation

No classification is proposed for skin sensitization or respiratory sensitization on the basis of theoretical considerations and in the absence of any outcome in those exposed after use at work for a long period of time.

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e) Germ cell mutagenicity

No classification is proposed for genotoxicity. The absence of mutagenicity was demonstrated in the Ames test, positive results in studies with mammalian cells is attributable to the effects of low pH. There are no studies in vivo, but the lack of systemic exposure to the substance and the lack of genotoxicity of hydrogen and sulfate ion is predicting lack of genotoxicity and therefore not necessary to perform specific tests.

The following is a summary of the study more representative of the registration dossier on sulfuric acid

Method	Results	Remarks	Reference
bacterial reverse mutation assay (e.g. Ames test) (gene mutation) S. typhimurium TA 1535, TA 1537, TA 98 and TA 100 (met. act.: with and without) Doses: 0 (solvent control), 20, 100, 500, 2500 and 12500 ug/plate; initial assay. 0 (solvent control), 775, 1550, 3100, 6200 and 12400 ug/plate; confirmatory assay OECD Guideline 471	Negative per S. typhimurium TA 1535, TA 1537, TA 98 and TA 100(all strains/cell types tested); met. act.: with and without; cytotoxicity: yes (In some strains)	weight of evidence of CAS 7681-38-1	Herbold BA (1988a)

f) Carcinogenicity

The available animal data do not support the classification of sulfuric acid for carcinogenicity. Weak evidence of a local carcinogenic effect on the forestomach/oesophagus was seen following lifetime oral gavage of rats with sulfuric acid at the MTD. Similarly, some evidence of a local carcinogenic effect on the respiratory tract was seen in rats treated with sulfuric acid by intratracheal instillation over a lifetime. A synergistic effect was seen in animals instilled with sulfuric acid and benzo(a) pyrene. A weak local carcinogenic effect was also seen in mice gavaged with sulfuric acid at the MTD over a lifetime. In all cases, findings were associated with chronic irritation at the site of contact. Although a number of epidemiological studies report a link between exposure to sulfuric acid mists and laryngeal cancer, the individual studies are imprecise and often do not take sufficient account of confounding factors such as smoking and occupational exposure to other chemicals. A number of studies (using various animal species) have not demonstrated any carcinogenic effect of inhalation exposure to sulfuric acid mists.

The following is a summary of the study more representative of the registration dossier. on sulfuric acid

Method	Results	Remarks	Reference
MOUSE Male/female Oral: gavage Exposure: Lifetime (Weekly)	no NOAEL identified (carcinogenicity): 0.2 mL of 0.2% aq solution (male/female) (Benign tumour of the forestomach)	Weight of evidence	Uleckiene S & Griuciute L (1997)

g) Reproductive toxicity

No classification is proposed for the reproductive and developmental toxicity. Existing data and the absence of systemic exposure indicate that the classification is not necessary.

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Fertility Effects:

Animal studies are not justified because of the lack of systemic exposure. There is no reason to consider the effects on reproduction that is supported by the results of animal studies which indicate that exposure effects are local.

Developmental toxicity / teratogenicity:

The following is a summary of the study more representative of the registration dossier on sulfuric acid

Method	Results	Remarks	Reference
Rabbit, mouse (New Zealand White, CF-1) inhalation: aerosol (whole body) 0, 5, 20 mg/m ³ (nominal conc.) 0, 5.7, 19.3 mg/m ³ (analytical conc.) Exposure: 7 hours/day: Day 6-18 of gestation (rabbit), Day 6-15 of gestation (mouse) (Daily) equivalent or similar to OECD Guideline 414 (Prenatal Developmental Toxicity Study)	LOAEC (mouse) (maternal toxicity): 19.3 mg/m ³ air (analytical) (Reduced food consumption) NOAEC (mouse) (maternal toxicity): 5.7 mg/m ³ air (analytical) (Reduced food consumption) NOAEC (mouse) (teratogenicity): 19.3 mg/m ³ air (analytical) (No teratogenicity at the highest exposure concentration) NOAEC (mouse) (developmental toxicity): 19.3 mg/m ³ air (analytical) (No developmental toxicity at the highest exposure concentration) LOAEC (rabbit) (maternal toxicity): 19.3 mg/m ³ air (analytical) (Reduced weight gain, local effects on the respiratory tract) NOAEC (rabbit) (maternal toxicity): 5.7 mg/m ³ air (analytical) (Reduced weight gain, local effects on the respiratory tract) NOAEC (rabbit) (teratogenicity): 19.3 mg/m ³ air (analytical) (No teratogenicity at the highest exposure level)	key study	Murray FJ, Schwetz BA, Nitschke KD, Crawford AA, Quast JF & Staples RE (1979)

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Method	Results	Remarks	Reference
	NOAEC (rabbit) (developmental toxicity): 19.3 mg/m ³ air (analytical) (No significant effects at the highest exposure concentration)		

h) STOT-single exposure

The products is classified as STOT SE 3: Highly irritating to the respiratory tract

i) STOT-repeated exposure

Classifications for severe effects after repeated or prolonged exposure was not proposed because even if the studies performed with sulfuric acid highlight the toxicity after repeated / prolonged exposure to low concentrations, there is no possibility of systemic toxicity and the effects observed in these studies are essentially a result of corrosion / irritation.

The following is a key study reported in the registration dossier on sulfuric acid

Method	Results	Remarks	Reference
rat (Wistar)) female subacute (inhalation: aerosol) (nose only) 0.00, 0.2, 1.0, 5.0 mg/m ³ (nominal conc.) 0.00, 0.30, 1.38, 5.52 mg/m ³ (analytical conc.) Vehicle: unchanged (no vehicle) Exposure: Animals were exposed for 6 hours/day; 5 days/week for 5 or 28 days. (Animals were exposed for 6 hours/day; 5 days/week for 5 or 28 days.) OECD Guideline 412 (Repeated Dose Inhalation Toxicity: 28/14- Day)	LOAEC: 0.3 mg/m ³ air (analytical) (female) based on: test mat. (Findings at 0.3 mg/m ³ were limited to minimal metaplastic change after 28 days, considered to be an adaptive response to a respiratory irritant.)	key study	Kilgour JD, Foster J, Soames A, Farrar DG & Hext PM (2002) Kilgour JD (2000)

j) Aspiration hazard:

Date non available.

Other informations

Not available.

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12. ECOLOGICAL INFORMATION

The sulfur trioxide in water reacts with water to form sulfuric acid, therefore, the information in this section regarding the sulfuric acid.

On the basis of ecological information below, and based on the criteria set by the regulations on hazardous substances, sulfuric acid is not dangerous for the environment.

12.1 Toxicity

Sulfuric acid is a strong mineral acid that dissociates readily in water to hydrogen ions and sulfate ions and is completely miscible with water. The total dissociation of sulfuric acid to pH environment means that it will not, by itself, or absorbed by particles that can accumulate in living tissue.

The following is a summary of the study more representative of the registration dossier on sulfuric acid

Endpoint	Result	Remarks	Reference
Aquatic toxicity			
Aquatic invertebrates Daphnia magna freshwater static short-term effects	EC50 48/h: >100 mg/l	key study	Weyers, A(2009a) OECD Guideline 202 (Daphnia sp. Acute Immobilisation Test)
Aquatic invertebrates Tanytarsus dissimilis long-term effects	NOEC: 0.15 mg/l	key study	Henry L. Bell (1977) OECD (2001f)
Algae Desmodesmus subspicatus (algae) freshwater static	EC50 (72 h): > 100 mg/L test mat. (nominal) based on: growth rate	key study	Weyers, A (2009b) OECD Guideline 201 (Alga, Growth Inhibition Test)
Fish Lepomis macrochirus freshwater static	LC50 96h: >16 - <28 mg/l	key study	Ellegaard, EG & JY Gilmore III (1984) OECD (2001c)
long-term effects on fish Salvelinus fontinalis freshwater embryo and sac-fry stage: (sub) lethal effects	NOEC : 0.31 mg/l	key study	Hurley, GV, TP Foyle & WJ White (1989)
Jordanella floridae freshwater reproduction, growth and survival flow-through	NOEC (65d): 0.025 mg/l	key study	Craig, GR & Baksi, WF (1977) OECD (2001c)
activated sludge freshwater	NOEC (37 d): ca. 26 g/l	“weight of evidence”	R. Yucel Tokuz and W. Wesley Eckenfelder Jr

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Endpoint	Result	Remarks	Reference
Aquatic toxicity			
static			(1979)

12.2 Persistence and degradability

Biotic Degradability: not required as inorganic compound.

Abiotic Degradability: the product is hydrolyzed

Not persistent.

12.3 Bioaccumulative potential

Not bioaccumulative

12.4 Mobility in soil

Is not adsorbed by soil particles.

12.5 Results of PBT and vPvB assessment

Comparison with the criteria in Annex XIII of REACH.

None of the criteria is met then the sulfuric acid is not a PBT or a substance vPvB.

12.6 Other adverse effects

Not present.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Disposal of wastes deriving from the product, including empty containers uncleaned up, has to be done according to official regulations.

It is therefore advisable to contact authorities or specialized and authorized companies which can provide guidelines on how to prepare the disposal of waste. The product should be disposed according to the official regulation, even if it derives from neutralization of spills or leaks.

Packaging: disposal in accordance with national legislation. Contaminated packaging must be handled with the same precautions used for hazardous substances.

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14. TRANSPORT INFORMATION

14.1 UN number

UN 1831

14.2 UN proper shipping name

SULPHURIC ACID FUMING

14.3 Transport hazard class(es)

Road/railway transport (RID/ADR/ADN): Class 8, CT1, Kemler X886

Sea transport (IMDG): Class 8+6.1
EmS: F-A, S-B

Air transport (IATA): Class 8

14.4 Packing group

I

14.5 Environmental hazards

This product is not dangerous for environment in accordance to ADR, IMDG, and IATA code.

14.6 Special precautions for user

Personnel dedicated to loading and unloading operation must undergo a specific training and use mask, gloves and goggles if necessary.

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

If you are going to stick to the bulk transport accord to the MARPOL 73/78 Annex II and IBC Code if applicable.

15. REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Authorisations according to REACH Regulation: the substance is not subject

Restrictions according to REACH Regulation: subject to restrictions under Title VIII (Annex XVII, item 3)

Other UE: the substance is not dangerous under the Seveso Regulation (Dir. 2012/18/UE, D. Lgs. 105/2015)

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More information:

The following are the descriptors of use (to CSR) related to the uses identified in section 1.2

SULPHURIC ACID:

Exposure Scenario	Sector of Use (SoU)	Process category (PROC)	Product Category (PC)	Environmental Release Category (ERC)
ES1- Production of sulfuric acid	n.a.	1, 2, 3, 4, 8a, 8b, 9	19	1
ES2- Use of sulfuric acid as an intermediate in manufacture of inorganic and organic chemicals incl. fertilizers	3, 4, 6b, 8, 9, 14	1, 2, 3, 4, 8a, 8b, 9	19	6a
ES3 - Use of sulfuric acid as a processing aid, catalyst, dehydrating agent, pH regulator	3, 4, 5, 6b, 8, 9, 11, 23, NACE code: E 36-37	1, 2, 3, 4, 8a, 8b, 9, 13	20	6b
ES4 - Use of sulfuric acid for extractions and processing of minerals, ores	3, 2a, 14	2, 3, 4	20, 40	6b, 4
ES5 - Use of sulfuric acid in the process of surface treatments, purification and etching	3, 2a, 14, 15, 16	1, 2, 3, 4, 8a, 8b, 9, 13	14, 15	6b
ES6 - Use of sulfuric acid in electrolytic processes	3, 14, 15, 17	1, 2, 8b, 9, 13	14, 20	6b, 5
ES7 - Use of sulfuric acid in gas purification, scrubbing, flue gas scrubbing	3, 8 NACE code : C20.1.1 : manufacturing of industrial gases	1, 2, 8b	20	7
ES8 - Use of sulfuric acid in production of sulfuric acid contained batteries	3 or 0 – NACE Code C27.2 (Manufacture of batteries and accumulators)	2, 3, 4, 9	0 – UCN Code E10100 (Electrolytes)	2, 5
ES9 - Use of sulfuric acid in maintenance of sulfuric acid contained batteries	22	19	0 – UCN Code E10100 (Electrolytes)	8b, 9b
ES10 - Use of sulfuric acid in recycling of sulfuric acid contained batteries	3	2, 4, 5, 8a	0 – UCN Code E10100 (Electrolytes)	1
ES11 - Use of sulfuric acid contained batteries	21	PROC 19	AC 3	9b
ES12 - Use of sulfuric acid as laboratory chemicals	22	15	21	8a, 8b
ES13 - Use of sulfuric acid in industrial cleaning	3	2, 5, 8a, 8b, 9, 10, 13	35	8a, 8b
ES14 - mixing, preparation and repackaging of sulfuric acid	3, 10	1, 3, 5, 8a, 8b, 9		2
ES15 - Use of sulfuric acid as a drain cleaner	22	8a as worst case	35	8a
ES16 - Use of sulfuric acid as a drain cleaner	21	n.a.	35	8a

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SULPHURIC TRIOXIDE

Exposure Scenario	Sector of Use (SoU)	Process category (PROC)	Product Category (PC)	Environmental Release Category (ERC)
ES1- Production of Sulfuric trioxide	3	1, 2, 8b, 9	Not applicable	1
ES2- Use of Sulfuric trioxide, as an intermediate	3, 8, 9	1, 2, 3, 4, 8b, 9	19	6a
ES3 - Use of oleum as a nitration agent	3, 8, 9	1, 2, 3, 4, 8b, 9	20, 21	6B
ES4 - Formulation of oleum	10	1,8b, 9	n.a.	2

Compilation date	24/02/2009
Updating date	Rev.1 - 19/03/2015 Rev.2 – 22/02/2016 Rev.3 – 27/02/2018
Grounds for review	Updated sections 1, 8 and 15 Updated sections 1, 2, 5, 11 and 15. Updated the list of identified uses by inserting a new exposure scenario. Update section 8

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ANNEX

EXPOSURE SCENARIOS

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SULFURIC ACID

1. Production of sulfuric acid

Section 1: Title of exposure scenario	
Short title of the exposure scenario: Production of sulfuric acid	
Title systematically based on the use of descriptors	
Sector of Use: (SU)	n.a.
Product Category: (PC)	n.a.
Process Categories: (PROC)	1, 2, 3, 4, 8a, 8b, 9
Environmental Release Category: (ERC)	1
Covered processes and activities	
Production of the substance. Sulfuric acid is most commonly manufactured from sulfur ((obtained from refining of crude oil) or from sulfur-containing gas released from high temperature processes such as metal smelting or burning fossil fuels) The production includes recovery/recycle, loading/unloading, storage, maintenance and sampling	
Evaluation methodology	
Refer to section 3	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product Characteristics	
Physical state	Liquid
Vapour pressure (Pa)	6
Molecular weight	98,08
Concentration of substance in product	25-100%
Operational conditions	
Use amount per worker [workplace] per day	Worker exposure considered to be negligible due to the specialized systems and closed nature of the production process.
Frequency at workplace	220 d/year
Duration per day at workplace [for one worker]	8hr/d
Other determinants related to duration, frequency and amount of use	Intermittent contact is expected
Respiration volume under conditions of use	10 m3/d (default value for a worker breathing for a 8hrs work day)
Skin contact area with the substance under conditions of use	480 cm2 (ECETOC default). Please note that due to the corrosive nature of sulfuric acid dermal exposure is not considered relevant for risk characterization as it must be prevented in all cases.
Room size and ventilation rate	n.a. (not relevant as workers work in a control room, with no direct contact to the installations housing the material)
Specific Risk management measures	
Containment plus good work practice required Local exhaust ventilation if required	Production and handling of sulfuric acid involves special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in the production and uses of sulfuric acid are usually housed outdoors. Waste gas from containers are collected and send by pipeline to a treatment facility (scrubber or filtration)
Personal protective equipment (PPE)	Production and handling of sulfuric acid involves special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in the production and uses of sulfuric acid are usually housed

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	<p>outdoors.</p> <p>Workers involved in sampling and transfer of materials to road tankers are trained in the procedures and protective equipment (gloves, respirator, face shield etc) is intended to cope with the worst case scenario, in order to minimize exposure and risks.</p>
Other risk management measures related to workers	A safety shower is required nearby loading and unloading areas in case of accidental spillage.
Section 2.2 Control of environmental exposure	
Product characteristics	
Molecular weight	98,08
Vapour pressure at 20°C (hPa)	0,1
Water solubility	Miscible
Octanol/water partition coefficient	-1 (logKow)
Koc	1
Biodegradability	Not biodegradable (inorganic acids cannot be considered biodegradable)
Amount of use	
Annual amount used per site	1.200.000 t/y
Annual amount used per region	19.000.000 t/y
Frequency and duration of use	
continuous production	
Emission days	365 d/y
Other operational conditions affecting environmental exposure	
Discharge volume of sewage treatment plant	2000 m3/d (EUSES default value for standard local STP)
Available river water volume to receive the emissions from a site	20.000 m3/d (Standard ERC flow rate leading to a 10 fold dilution in receiving waters.)
Risk management measures related to environmental emissions from industrial sites	
Onsite pre-treatment of waste water	Waste waters are generally treated by on site WWTP which will be neutralised before it reaches the biological tower of the WWTP or will be treated on site by chemical neutralisation methods before release to the municipal STP or to the environment.
Resulting fraction of initially applied amount in waste water released from site to the external sewage system	The neutralisation process is extremely efficient and pH monitors are in place to ensure that complete neutralisation and removal have taken place.
Air emission abatement	Effectiveness: Adequate measures in place Exhaust gases may be treated by scrubbers or emissions may be measured and controlled according to local legislation.
Release to air	33 kg/d (Based on worst case measured emissions associated with production)
Onsite waste treatment	The waste water neutralisation process is extremely efficient with almost total neutralisation achieved. pH alarms are in place to ensure that successful neutralisation has taken place.
Effluent (of the waste water treatment plant) discharge rate	2000 m3/ d (default value)
Recovery of sludge for agriculture or horticulture	No All sludge is collected and incinerated or sent to landfill.

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Fractions of substance in waste and waste management measures		
Amount of substances in waste water resulting from identified uses covered in the exposure scenario	0 kg/d (value based on the specialised waste water treatment procedures)	
Amount of substances in waste resulting from service life of articles	n.a.	
Type of waste, suitable waste codes	Suitable EWC code(s)	
Type of external treatment aiming at recycling or recovery of substances	None	
Type of external treatment aiming at final disposal of the waste	Incineration or landfill.	
Fraction of substance released into the environment via air from waste handling	n.a.	
Fraction of substance released into the environment via waste water from waste handling	n.a.	
Fraction of substance disposed of as secondary waste	n.a.	
Section 3 Exposure estimation		
3.1 Health		
ECETOC TRA model to conduct a Tier 1 assessment of inhalation exposure concentrations ECETOC TRA Model input parameters:		
	Parameter	
Molecular weight	98,08 g/ mol	
Vapour pressure	6 Pa	
Is the substance a solid?	No: liquid	
Dustiness during process	n.a.	
Duration of activity	> 4 h	
Use of ventilation	Indoors without LEV	
The ECETOC exposure estimation is considered to be unsatisfactory and is not considered relevant for risk characterisation purposes.		
ART model to conduct a Tier 2 assessment of inhalation exposure concentrations ART Model input parameters:		
	PROC	Parameters/assumptions
Exposure duration	All	480 mins
Product type	All	Liquid (medium viscosity – like oil)
Process temperature	1, 2, 3, 4	Hot processes (50-150°C)
	8a, 8b, 9	Room temperature (15-25°C)
Vapour pressure	All	6 Pa (Substance is considered to be low volatile, exposure to mists is estimated)
Liquid weight fraction	All	0,98
Primary emission source proximity	1, 2	Primary emission source is not located in the breathing zone of the worker - the assessment for this activity involves a primary far-field emission source only (workers are in a control room)
	3, 4, 8A, 8b, 9	Primary emission source located in the breathing zone of the workers (i.e. Within 1 metre)

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Activity class	All	Transfer of liquid products
Containment	1, 2, 3, 9	Handling reduces contact between product and adjacent air
	4	Open process, submerged loading
	8a, 8b	n.a.
Localized controls	1, 3, 8b	Vapour recovery system, LEV
	2, 4, 9	Vapour recovery
	8a	None
Segregation	1, 2	Complete segregation of workers in separate control room
Fugitive emission sources	1, 3, 8b, 9	Process fully enclosed – not breached for sampling
	2, 4, 8a	Not fully enclosed – effective housekeeping practices in place.
Dispersion	1, 2, 8a, 8b	Outdoors not close to buildings
	3, 4	Outdoors near to buildings
	9	Indoors, any sized room, only good natural ventilation

The estimated short and long-term concentrations are lower than relevant DNEL for all process categories.

3.2 Environment

Tier 1 assessment has been carried out applying EUSES model with standard input data and ERC.

Tier 1 assessment resulted a not realistic exposition.

Tier 2 assessment has been carried out applying EUSES model; refined inputs are chosen to best suit the description of the production and uses of sulfuric acid.

EUSES model input parameters

Input parameter	Value	Unit	ERC default (if applicable)
Molecular weight	98,08	g/mol	
Vapour pressure at 20°C	0,1	hPa	
Water solubility	miscible	Mg/ml	
Octanol/water partition coefficient	-1	LogKow	
Koc	1		
Biodegradability	Not biodegradable		
Life Cycle Step	Production		
Environmental Release Class	ERC1		
Fraction of Tonnage for Region (1 Tier)			1
STP			Yes
Emission events per year	365	days	300
Default Release to Air	5	%	5
Default Release to water	6	%	6
Dilution factor applied for PEC derivation			10 (20.000 m3/d)
Tonnage assessed	Local: 1,2 Regional: 19	Milion tonnes/ year	

RMMs and measured values for tier 2 assessment.

Description of RMM	Details	Effect taken into account in EUSES	Comments
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No loss to waste water	0 mg/l	Lowering of concentration in STP effluent to 0 mg/L due to the very efficient neutralization process	Total neutralization to around pH 7.
Emission days	365 emission days per year	Increase emission days by 20%.	Continuous production
Sludge removal	Sludge removed to landfill or incinerated.	Concentration in soil due to sludge spreading set to 0.	No contamination of grassland or agricultural soil.
Measured stack gas emissions	Atmospheric losses of 1.375kg/hour.	Emission to the air of 33.3 kg/day.	Worst case emissions

All estimated concentrations are lower than relevant DNEL.

Section 4 Guidance to check compliance with exposure scenario

4.1 Health

Estimated workplace exposures are not expected to exceed DNELs when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 3.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

4.2 Environment

Estimated exposures are not expected to exceed PNEC when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 2.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

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2. Use of sulfuric acid as an Intermediate in manufacture of inorganic and organic chemicals including fertilizers

Section 1: Title of exposure scenario	
Short title of the exposure scenario: Use of sulfuric acid as an Intermediate in manufacture of inorganic and organic chemicals including fertilizers	
Title systematically based on the use of descriptors	
Sector of Use: (SU)	3, 4, 6b, 8, 9, 14
Product Category: (PC)	19
Process Categories: (PROC)	1, 2, 3, 4, 8a, 8b, 9
Environmental Release Category: (ERC)	6a
Covered processes and activities	
The use of sulfuric acid as an intermediate in the production of inorganic and organic chemicals including but not limited to the production of fertilizers includes the production of oils used for lipolysis, sulphates, nitrogen fertilizers, granulation of complex fertilizers, phosphoric acid (wet process), titanium dioxide (sulphate route), hydrofluoric acid, fine chemicals and specialty chemicals. In addition to these uses the exposure scenario for intermediate use also includes reactive use in water treatment, use as a granulating agent and use as a tanning agent whereas sulfuric acid is consumed in a chemical synthesis to form sulphate.	
Evaluation methodology	
Refer to section 3	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product Characteristics	
Physical state	Liquid
Vapour pressure (Pa)	6
Molecular weight	98,08
Concentration of substance in product	n.a. (sulfuric acid is used up in the process)
Operational conditions	
Use amount per worker [workplace] per day	Worker contact is generally very low as most operations are remotely controlled and sampling/analysis events are of short duration.
Frequency at workplace	220 d/year
Duration per day at workplace [for one worker]	8hr/d
Other determinants related to duration, frequency and amount of use	Intermittent contact is expected
Respiration volume under conditions of use	10 m3/d (default value for a worker breathing for a 8hrs work day)
Skin contact area with the substance under conditions of use	480 cm2 (ECETOC default). Please note that due to the corrosive nature of sulfuric acid dermal exposure is not considered relevant for risk characterization as it must be prevented in all cases.
Room size and ventilation rate	n.a. (not relevant as workers work in a control room, with no direct contact to the installations housing the material)
Specific Risk management measures	
Containment plus good work practice required Local exhaust ventilation if required	Production and handling of sulfuric acid involves special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in the production and uses of sulfuric acid are usually housed outdoors.

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	Waste gas from containers are collected and send by pipeline to a treatment facility (scrubber or filtration).
Personal protective equipment (PPE)	Production and handling of sulfuric acid involves special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in the production and uses of sulfuric acid are usually housed outdoors. Workers involved in sampling and transfer of materials to road tankers are trained in the procedures and protective equipment (gloves, respirator, face shield etc) is intended to cope with the worst case scenario, in order to minimize exposure and risks.
Other risk management measures related to workers	A safety shower is required nearby loading and unloading areas in case of accidental spillage.
Section 2.2 Control of environmental exposure	
Product characteristics	
Molecular weight	98,08
Vapour pressure at 20°C (hPa)	0,1
Water solubility	Miscible
Octanol/water partition coefficient	-1 (logKow)
Koc	1
Biodegradability	Not biodegradable (inorganic acids cannot be considered biodegradable)
Amount of use	
Annual amount used per site	300.000 t/y
Frequency and duration of use	
continuous production	
Emission days	365 d/y
Other operational conditions affecting environmental exposure	
Discharge volume of sewage treatment plant	2000 m3/d (EUSES default value for standard local STP)
Available river water volume to receive the emissions from a site	20.000 m3/d (Standard ERC flow rate leading to a 10 fold dilution in receiving waters.)
Risk management measures related to environmental emissions from industrial sites	
Onsite pre-treatment of waste water	Waste waters are generally treated by on site WWTP which will be neutralised before it reaches the biological tower of the WWTP or will be treated on site by chemical neutralisation methods before release to the municipal STP or to the environment.
Resulting fraction of initially applied amount in waste water released from site to the external sewage system	The neutralisation process is extremely efficient and pH monitors are in place to ensure that complete neutralisation and removal have taken place.
Air emission abatement	Treated by scrubbers.
Onsite waste treatment	The waste water neutralisation process is extremely efficient with almost total neutralisation achieved. pH alarms are in place to ensure that successful neutralisation has taken place.
Effluent (of the waste water treatment plant) discharge rate	2000 m3/ d (default value)
Recovery of sludge for agriculture or horticulture	No All sludge is collected and incinerated or sent to landfill.
Fractions of substance in waste and waste management measures	

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Amount of substances in waste water resulting from identified uses covered in the exposure scenario	0 kg/d (value based on the specialised waste water treatment procedures)
Amount of substances in waste resulting from service life of articles	n.a.
Type of waste, suitable waste codes	Suitable EWC code(s)
Type of external treatment aiming at recycling or recovery of substances	None
Type of external treatment aiming at final disposal of the waste	Incineration or landfill.
Fraction of substance released into the environment via air from waste handling	n.a.
Fraction of substance released into the environment via waste water from waste handling	n.a.
Fraction of substance disposed of as secondary waste	n.a.

Section 3 Exposure estimation

3.1 Health

ECETOC TRA model to conduct a Tier 1 assessment of inhalation exposure concentrations.

ECETOC TRA Model input parameters:

	Parameter
Molecular weight	98,08 g/ mol
Vapour pressure	6 Pa
Is the substance a solid?	No: liquid
Dustiness during process	n.a.
Duration of activity	> 4 h
Use of ventilation	Indoors without LEV

The ECETOC exposure estimation is considered to be unsatisfactory and is not considered relevant for risk characterisation purposes.

ART model to conduct a Tier 2 assessment of inhalation exposure concentrations.

ART Model input parameters:

	PROC	Parameters/assumptions
Exposure duration	All	480 mins
Product type	All	Liquid (medium viscosity – like oil)
Process temperature	1, 2, 3, 4	Hot processes (50-150°C)
	8a, 8b, 9	Room temperature (15-25°C)
Vapour pressure	All	6 Pa (Substance is considered to be low volatile, exposure to mists is estimated)
Liquid weight fraction	All	0,98
Primary emission source proximity	1, 2	Primary emission source is not located in the breathing zone of the worker - the assessment for this activity involves a primary far-field emission source only (workers are in a control room)
	3, 4, 8A, 8b, 9	Primary emission source located in the breathing zone of the workers (i.e. Within 1 metre)
Activity class	All	Transfer of liquid products

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Containment	1, 2, 3, 9	Handling reduces contact between product and adjacent air
	4	Open process, submerged loading
	8a, 8b	n.a.
Localized controls	1, 3, 8b	Vapour recovery system, LEV
	2, 4, 9	Vapour recovery
	8a	None
Segregation	1, 2	Complete segregation of workers in separate control room
Fugitive emission sources	1, 3, 8b, 9	Process fully enclosed – not breached for sampling
	2, 4, 8a	Not fully enclosed – effective housekeeping practices in place.
Dispersion	1, 2, 8a, 8b	Outdoors not close to buildings
	3, 4	Outdoors near to buildings
	9	Indoors, any sized room, only good natural ventilation

The estimated short and long-term concentrations are lower than relevant DNEL for all process categories.

3.2 Environment

Tier 1 assessment has been carried out applying EUSES model with standard input data and ERC.

Tier 1 assessment resulted a not realistic exposition.

Tier 2 assessment has been carried out applying EUSES model; refined inputs are chosen to best suit the description of the production and uses of sulfuric acid.

EUSES model input parameters

Input parameter	Value	Unit	ERC default (if applicable)
Molecular weight	98,08	g/mol	
Vapour pressure at 20°C	0,1	hPa	
Water solubility	miscible	Mg/ml	
Octanol/water partition coefficient	-1	LogKow	
Koc	1		
Biodegradability	Not biodegradable		
Life Cycle Step	Industrial use		
Environmental Release Class	ERC 6A		
Fraction of Tonnage for Region (1 Tier)			1
STP			Yes
Emission events per year	365	days	300
Default Release to Air	5	%	5
Default Release to water	2	%	2
Dilution factor applied for PEC derivation			10 (20.000 m3/d)
Tonnage assessed	Local: 300.000	tonnes/ year	Worst case single site use rate

RMMs and measured values for tier 2 assessment.

Description of RMM	Details	Effect taken into account in EUSES	Comments
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No loss to waste water	0 mg/l	Lowering of concentration in STP effluent to 0 mg/L due to the very efficient neutralization process	Total neutralization to around pH 7.
Emission days	365 emission days per year	Increase emission days by 20%.	Continuous production
Sludge removal	Sludge removed to landfill or incinerated.	Concentration in soil due to sludge spreading set to 0.	No contamination of grassland or agricultural soil.
Measured stack gas emissions	Worst case concentration of 46 mg/m ³ and an hourly flow rate of 86,000 m ³ /h.	Emission to the air of 94,9 kg/day.	Worst case emissions

All estimated concentrations are lower than relevant DNEL.

Section 4 Guidance to check compliance with exposure scenario

4.1 Health

Estimated workplace exposures are not expected to exceed DNELs when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 3.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

4.2 Environment

Estimated exposures are not expected to exceed PNEC when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 2.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

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3 Use of sulfuric acid as a processing aid, catalyst, dehydrating agent, pH regulator.

Section 1: Title of exposure scenario	
Short title of the exposure scenario: Use of sulfuric acid as a processing aid, catalyst, dehydrating agent, pH regulator	
Title systematically based on the use of descriptors	
Sector of Use: (SU)	3, 4, 5, 6b, 8, 9, 11, 23
Product Category: (PC)	20
Process Categories: (PROC)	1, 2, 3, 4, 8a, 8b, 9, 13
Environmental Release Category: (ERC)	6b
Covered processes and activities	
Sulfuric acid is used in the industrial manufacture of organic chemicals and fine chemicals. These processes include using sulfuric acid in large volumes as a processing aid, catalyst or dehydration agent in the chemical process of manufacture of adhesives, explosives, acids, organic salts, dyes and pigments, biofuels, pharmaceuticals and the alkylation of aliphatics. Sulfuric acid may also be used to regulate pH in water streams and as a process aid in the leather and textiles industry.	
Evaluation methodology	
Refer to section 3	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product Characteristics	
Physical state	Liquid
Vapour pressure (Pa)	6
Molecular weight	98,08
Concentration of substance in product	98% (Concentrated acid generally used)
Operational conditions	
Use amount per worker [workplace] per day	Worker contact is generally very low as most operations are remotely controlled and sampling/analysis events are of short duration.
Frequency at workplace	220 d/year
Duration per day at workplace [for one worker]	8hr/d
Other determinants related to duration, frequency and amount of use	Intermittent contact is expected
Respiration volume under conditions of use	10 m ³ /d (default value for a worker breathing for a 8hrs work day)
Skin contact area with the substance under conditions of use	480 cm ² (ECETOC default). Please note that due to the corrosive nature of sulfuric acid dermal exposure is not considered relevant for risk characterization as it must be prevented in all cases.
Room size and ventilation rate	n.a. (not relevant as workers work in a control room, with no direct contact to the installations housing the material)
Specific Risk management measures	
Containment plus good work practice required Local exhaust ventilation if required	Production and handling of sulfuric acid involves special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in the production and uses of sulfuric acid are usually housed outdoors. Waste gas from containers are collected and send by pipeline to a treatment facility (scrubber or filtration).
Personal protective equipment (PPE)	Production and handling of sulfuric acid involves special equipment and high

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	<p>integrity contained systems with little or no potential for exposure. Facilities involved in the production and uses of sulfuric acid are usually housed outdoors.</p> <p>Workers involved in sampling and transfer of materials to road tankers are trained in the procedures and protective equipment (gloves, respirator, face shield etc) is intended to cope with the worst case scenario, in order to minimize exposure and risks.</p>
Other risk management measures related to workers	A safety shower is required nearby loading and unloading areas in case of accidental spillage.
Section 2.2 Control of environmental exposure	
Product characteristics	
Molecular weight	98,08
Vapour pressure at 20°C (hPa)	0,1
Water solubility	Miscible
Octanol/water partition coefficient	-1 (logKow)
Koc	1
Biodegradability	Not biodegradable (inorganic acids cannot be considered biodegradable)
Amount of use	
Annual amount used per site	100.000 t/y (worst case site)
Frequency and duration of use	
continuous production	
Emission days	365 d/y
Other operational conditions affecting environmental exposure	
Discharge volume of sewage treatment plant	2000 m3/d (EUSES default value for standard local STP)
Available river water volume to receive the emissions from a site	20.000 m3/d (Standard ERC flow rate leading to a 10 fold dilution in receiving waters.)
Risk management measures related to environmental emissions from industrial sites	
Onsite pre-treatment of waste water	Waste waters are generally treated by on site WWTP which will be neutralised before it reaches the biological tower of the WWTP or will be treated on site by chemical neutralisation methods before release to the municipal STP or to the environment.
Resulting fraction of initially applied amount in waste water released from site to the external sewage system	The neutralisation process is extremely efficient and pH monitors are in place to ensure that complete neutralisation and removal have taken place.
Air emission abatement	Treated by scrubbers.
Resulting fraction of applied amount in waste gas released to environment	274 kg/d
Onsite waste treatment	The waste water neutralisation process is extremely efficient with almost total neutralisation achieved. pH alarms are in place to ensure that successful neutralisation has taken place.
Effluent (of the waste water treatment plant) discharge rate	2000 m3/ d (default value)
Recovery of sludge for agriculture or horticulture	No All sludge is collected and incinerated or sent to landfill.
Fractions of substance in waste and waste management measures	
Amount of substances in waste water resulting from identified uses covered in the exposure scenario	0 kg/d (value based on the specialised waste water treatment procedures)

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Amount of substances in waste resulting from service life of articles	n.a.
Type of waste, suitable waste codes	Suitable EWC code(s)
Type of external treatment aiming at recycling or recovery of substances	None
Type of external treatment aiming at final disposal of the waste	Incineration or landfill.
Fraction of substance released into the environment via air from waste handling	n.a.
Fraction of substance released into the environment via waste water from waste handling	n.a.
Fraction of substance disposed of as secondary waste	n.a.

Section 3 Exposure estimation

3.1 Health

ECETOC TRA model to conduct a Tier 1 assessment of inhalation exposure concentrations.

ECETOC TRA Model input parameters:

	Parameter
Molecular weight	98,08 g/ mol
Vapour pressure	6 Pa
Is the substance a solid?	No: liquid
Dustiness during process	n.a.
Duration of activity	> 4 h
Use of ventilation	Indoors without LEV

The ECETOC exposure estimation is considered to be unsatisfactory and is not considered relevant for risk characterisation purposes.

ART model to conduct a Tier 2 assessment of inhalation exposure concentrations.

ART Model input parameters:

	PROC	Parameters/assumptions
Exposure duration	All	480 mins
Product type	All	Liquid (medium viscosity – like oil)
Process temperature	1, 2, 3, 4	Hot processes (50-150°C)
	8a, 8b, 9,13	Room temperature (15-25°C)
Vapour pressure	All	6 Pa (Substance is considered to be low volatile, exposure to mists is estimated)
Liquid weight fraction	All	0,98
Primary emission source proximity	1, 2	Primary emission source is not located in the breathing zone of the worker - the assessment for this activity involves a primary far-field emission source only (workers are in a control room)
	3, 4, 8A, 8b, 9, 13	Primary emission source located in the breathing zone of the workers (i.e. Within 1 metre)
Activity class	1,2,3,4,8a,8b,9	Transfer of liquid products
	13	Activities with open liquid surface or reservoirs

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Containment	1, 2, 3, 9	Handling reduces contact between product and adjacent air
	4	Open process, submerged loading
	8a, 8b, 13	n.a.
Localized controls	1, 3, 8b	Vapour recovery system, LEV
	2, 4, 9	Vapour recovery
	8a, 13	None
Segregation	1, 2	Complete segregation of workers in separate control room
Fugitive emission sources	1, 3, 8b, 9	Process fully enclosed – not breached for sampling
	2, 4, 8a, 13	Not fully enclosed – effective housekeeping practices in place.
Dispersion	1, 2, 8a, 8b	Outdoors not close to buildings
	3, 4	Outdoors near to buildings
	9, 13	Indoors, any sized room, only good natural ventilation

The estimated short and long-term concentrations are lower than relevant DNEL for all process categories.

3.2 Environment

Tier 1 assessment has been carried out applying EUSES model with standard input data and ERC.

Tier 1 assessment resulted a not realistic exposition.

Tier 2 assessment has been carried out applying EUSES model; refined inputs are chosen to best suit the description of the production and uses of sulfuric acid.

EUSES model input parameters

Input parameter	Value	Unit	ERC default (if applicable)
Molecular weight	98,08	g/mol	
Vapour pressure at 20°C	0,1	hPa	
Water solubility	miscible	Mg/ml	
Octanol/water partition coefficient	-1	LogKow	
Koc	1		
Biodegradability	Not biodegradable		
Life Cycle Step	Industrial use		
Environmental Release Class	ERC 6B		
Fraction of Tonnage for Region (1 Tier)			1
STP			Yes
Emission events per year	365	days	300 (bases on tonnage band and use)
Default Release to Air	0,1	%	0,1
Default Release to water	5	%	5
Dilution factor applied for PEC derivation			10 (20.000 m3/d)
Tonnage assessed	100.000	tonnes/ year	

RMMs and measured values for tier 2 assessment.

Description of RMM	Details	Effect taken into account in EUSES	Comments
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No loss to waste water	0 mg/l	Lowering of concentration in STP effluent to 0 mg/L due to the very efficient neutralization process	Total neutralization to around pH 7.
Emission days	365 emission days per year	Increase emission days by 20%.	Continuous production
Sludge removal	Sludge removed to landfill or incinerated.	Concentration in soil due to sludge spreading set to 0.	No contamination of grassland or agricultural soil.

All estimated concentrations are lower than relevant DNEL.

Section 4 Guidance to check compliance with exposure scenario

4.1 Health

Estimated workplace exposures are not expected to exceed DNELs when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 3.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

4.2 Environment

Estimated exposures are not expected to exceed PNEC when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 2.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

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4 Use of sulfuric acid for extractions and processing of minerals, ores

Section 1: Title of exposure scenario	
Short title of the exposure scenario: Use of sulfuric acid for extractions and processing of minerals, ores	
Title systematically based on the use of descriptors	
Sector of Use: (SU)	2a, 3, 14
Product Category: (PC)	20, 40
Process Categories: (PROC)	2, 3, 4
Environmental Release Category: (ERC)	4, 6b
Covered processes and activities	
This use includes leaching, dissolution and enrichment of ores including zinc, copper, nickel and uranium. Metal removal from sand and clay and titanium limonite leaching are also encompassed under this use. The sulfuric acid can then be stripped of its ore or minerals and can then be re-circulated and re-used.	
Evaluation methodology	
Refer to section 3	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product Characteristics	
Physical state	Liquid
Vapour pressure (Pa)	6
Molecular weight	98,08
Concentration of substance in product	98% (Generally concentrated sulfuric acid is used initially but it may be diluted somewhat for certain applications and in the formulation of the extraction solution.)
Operational conditions	
Use amount per worker [workplace] per day	Worker contact is generally very low as most operations are remotely controlled and sampling/analysis events are of short duration.
Frequency at workplace	220 d/year
Duration per day at workplace [for one worker]	8hr/d
Other determinants related to duration, frequency and amount of use	Intermittent contact is expected - These tasks rarely take a full 8hr / day
Respiration volume under conditions of use	10 m3/d (default value for a worker breathing for a 8hrs work day)
Skin contact area with the substance under conditions of use	480 cm2 (ECETOC default). Please note that due to the corrosive nature of sulfuric acid dermal exposure is not considered relevant for risk characterization as it must be prevented in all cases.
Room size and ventilation rate	n.a. (not relevant as workers work in a control room, with no direct contact to the installations housing the material)
Specific Risk management measures	
Containment plus good work practice required Local exhaust ventilation if required	Working with sulfuric acid involves special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in the production and uses of sulfuric 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. The heap leaching processes in Europe do not take place in the open air usually.
Personal protective equipment (PPE)	Working with sulfuric acid involves special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in the production and uses of sulfuric acid are usually housed outdoors. Workers involved in sampling and transfer of materials to road tankers are

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	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	A safety shower is required nearby loading and unloading areas in case of accidental spillage.
Section 2.2 Control of environmental exposure	
Product characteristics	
Molecular weight	98,08
Vapour pressure at 20°C (hPa)	0,1
Water solubility	Miscible
Octanol/water partition coefficient	-1 (logKow)
Koc	1
Biodegradability	Not biodegradable (inorganic acids cannot be considered biodegradable)
Amount of use	
Annual amount used per site	438 t/y (worst case site)
Frequency and duration of use	
continuous production	
Emission days	365 d/y
Other operational conditions affecting environmental exposure	
Discharge volume of sewage treatment plant	2000 m3/d (EUSES default value for standard local STP)
Available river water volume to receive the emissions from a site	20.000 m3/d (Standard ERC flow rate leading to a 10 fold dilution in receiving waters.)
Risk management measures related to environmental emissions from industrial sites	
Onsite pre-treatment of waste water	Waste waters are generally treated on site by chemical and/or biological methods before release to the municipal STP or to the environment.
Onsite waste treatment	All sludge is collected and processed for residual metal recovery, incinerated or sent to landfill.
Fractions of substance in waste and waste management measures	
Amount of substances in waste water resulting from identified uses covered in the exposure scenario	0 kg/d (value based on the specialised waste water treatment procedures)
Amount of substances in waste resulting from service life of articles	n.a.
Type of waste, suitable waste codes	Suitable EWC code(s)
Type of external treatment aiming at recycling or recovery of substances	None
Type of external treatment aiming at final disposal of the waste	Residual, metal recovery, incineration or landfill.
Fraction of substance released into the environment via air from waste handling	n.a.
Fraction of substance released into the environment via waste water from waste handling	n.a.
Fraction of substance disposed of as secondary waste	n.a.
Section 3 Exposure estimation	
3.1 Health	
ECETOC TRA model to conduct a Tier 1 assessment of inhalation exposure concentrations. ECETOC TRA Model input parameters:	
	Parameter
Molecular weight	98,08 g/ mol

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Vapour pressure	6 Pa
Is the substance a solid?	No: liquid
Dustiness during process	n.a.
Duration of activity	> 4 h
Use of ventilation	Indoors without LEV

The ECETOC exposure estimation is considered to be unsatisfactory and is not considered relevant for risk characterisation purposes.

ART model to conduct a Tier 2 assessment of inhalation exposure concentrations.

ART Model input parameters:

	PROC	Parameters/assumptions
Exposure duration	All	480 mins
Product type	All	Liquid (medium viscosity – like oil)
Process temperature	1, 2, 3, 4	Hot processes (50-150°C)
	8a, 8b, 9,13	Room temperature (15-25°C)
Vapour pressure	All	6 Pa (Substance is considered to be low volatile, exposure to mists is estimated)
Liquid weight fraction	All	0,98
Primary emission source proximity	2	Primary emission source is not located in the breathing zone of the worker (workers are in a control room)
	3, 4	Primary emission source located in the breathing zone of the workers (i.e. Within 1 metre)
Activity class	All	Transfer of liquid products
Containment	2, 3	Handling reduces contact between product and adjacent air
	4	Open process, submerged loading
Localized controls	2	Vapour recovery system, LEV
	2, 4	Vapour recovery
Segregation	2	Complete segregation of workers in separate control room
Fugitive emission sources	3	Process fully enclosed – not breached for sampling
	2, 4	Not fully enclosed – effective housekeeping practices in place.
Dispersion	2	Outdoors not close to buildings
	3, 4	Outdoors near to buildings

The estimated short and long-term concentrations are lower than relevant DNEL for all process categories.

3.2 Environment

Tier 1 assessment has been carried out applying EUSES model with standard input data and ERC.

Tier 1 assessment resulted a not realistic exposition.

Tier 2 assessment has been carried out applying EUSES model; refined inputs are chosen to best suit the description of the production and uses of sulfuric acid.

EUSES model input parameters

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Input parameter	Value	Unit	ERC default (if applicable)
Molecular weight	98,08	g/mol	
Vapour pressure at 20°C	0,1	hPa	
Water solubility	miscible	Mg/ml	
Octanol/water partition coefficient	-1	LogKow	
Koc	1		
Biodegradability	Not biodegradable		
Life Cycle Step	Industrial use		
Environmental Release Class	ERC 6B and 4		
Fraction of Tonnage for Region (1 Tier)			1
STP			Yes
Emission events per year	330	days	20
Default Release to Air	ERC4 : 95 ERC 6B: 0,1	%	ERC4 : 95 ERC 6B: 0,1
Default Release to water	ERC4 : 100 ERC 6B: 5	%	ERC4 : 100 ERC 6B: 5
Dilution factor applied for PEC derivation			10 (20.000 m3/d)
Tonnage assessed	438	tonnes/ year	

RMMs and measured values for tier 2 assessment.

Description of RMM	Details	Effect taken into account in EUSES	Comments
No loss to waste water	0 mg/l	Lowering of concentration in STP effluent to 0 mg/L due to the very efficient neutralization process	Total neutralization to around pH 7.
Emission days	365 emission days per year	Increase emission days by 20%.	Continuous production
Sludge removal	Sludge processed for metal recovery, removed to landfill or incinerated.	Concentration in soil due to sludge spreading set to 0.	No contamination of grassland or agricultural soil.

All estimated concentrations are lower than relevant DNEL.

Section 4 Guidance to check compliance with exposure scenario

4.1 Health

Estimated workplace exposures are not expected to exceed DNELs when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 3.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

4.2 Environment

Estimated exposures are not expected to exceed PNEC when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 2.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

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5. Use of sulfuric acid in the process of surface treatments, purification and etching

Section 1: Title of exposure scenario	
Short title of the exposure scenario: Use of sulfuric acid in the process of surface treatments, purification and etching	
Title systematically based on the use of descriptors	
Sector of Use: (SU)	2a, 3, 14, 15, 16
Product Category: (PC)	14, 15
Process Categories: (PROC)	1,2, 3, 4, 8a, 8b, 9, 13
Environmental Release Category: (ERC)	6b
Covered processes and activities	
Use of sulfuric acid as a metal surface treatment and etching agent. Sulfuric 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.	
Evaluation methodology	
Refer to section 3	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product Characteristics	
Physical state	Liquid
Vapour pressure (Pa)	6
Molecular weight	98,08
Concentration of substance in product	98% (Concentrated acid. Slightly diluted concentrations may also be used)
Operational conditions	
Use amount per worker [workplace] per day	Worker exposure should be low and controlled
Frequency at workplace	220 d/year
Duration per day at workplace [for one worker]	8hr/d
Other determinants related to duration, frequency and amount of use	Intermittent contact is expected -
Respiration volume under conditions of use	10 m3/d (default value for a worker breathing for a 8hrs work day)
Skin contact area with the substance under conditions of use	480 cm2 (ECETOC default). Please note that due to the corrosive nature of sulfuric acid dermal exposure is not considered relevant for risk characterization as it must be prevented in all cases.
Room size and ventilation rate	n.a. (not relevant as workers work in a control room, with no direct contact to the installations housing the material)
Specific Risk management measures	
Containment plus good work practice required Local exhaust ventilation if required	Working with sulfuric acid involves special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in the production and uses of sulfuric 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)	Working with sulfuric acid involves special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in the production and uses of sulfuric 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

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	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	A safety shower is required nearby loading and unloading areas in case of accidental spillage.
Section 2.2 Control of environmental exposure	
Product characteristics	
Molecular weight	98,08
Vapour pressure at 20°C (hPa)	0,1
Water solubility	Miscible
Octanol/water partition coefficient	-1 (logKow)
Koc	1
Biodegradability	Not biodegradable (inorganic acids cannot be considered biodegradable)
Amount of use	
Annual amount used per site	10.000 t/y (worst case site)
Frequency and duration of use	
continuous production	
Emission days	365 d/y
Other operational conditions affecting environmental exposure	
Discharge volume of sewage treatment plant	2000 m3/d (EUSES default value for standard local STP)
Available river water volume to receive the emissions from a site	20.000 m3/d (Standard ERC flow rate leading to a 10 fold dilution in receiving waters.)
Risk management measures related to environmental emissions from industrial sites	
Onsite pre-treatment of waste water	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.
Fractions of substance in waste and waste management measures	
Amount of substances in waste water resulting from identified uses covered in the exposure scenario	0 kg/d (value based on the specialised waste water treatment procedures)
Amount of substances in waste resulting from service life of articles	n.a.
Type of waste, suitable waste codes	Suitable EWC code(s)
Type of external treatment aiming at recycling or recovery of substances	None
Type of external treatment aiming at final disposal of the waste	Incineration or landfill.
Fraction of substance released into the environment via air from waste handling	n.a.
Fraction of substance released into the environment via waste water from waste handling	n.a.
Fraction of substance disposed of as secondary waste	n.a.
Section 3 Exposure estimation	
3.1 Health	
ECETOC TRA model to conduct a Tier 1 assessment of inhalation exposure concentrations. ECETOC TRA Model input parameters:	
	Parameter

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Molecular weight	98,08 g/ mol
Vapour pressure	6 Pa
Is the substance a solid?	No: liquid
Dustiness during process	n.a.
Duration of activity	> 4 h
Use of ventilation	Indoors without LEV

The ECETOC exposure estimation is considered to be unsatisfactory and is not considered relevant for risk characterisation purposes.

ART model to conduct a Tier 2 assessment of inhalation exposure concentrations.

ART Model input parameters:

	PROC	Parameters/assumptions
Exposure duration	All	480 mins
Product type	All	Liquid (medium viscosity – like oil)
Process temperature	1, 2, 3, 4	Hot processes (50-150°C)
	8a, 8b, 9,13	Room temperature (15-25°C)
Vapour pressure	All	6 Pa (Substance is considered to be low volatile, exposure to mists is estimated)
Liquid weight fraction	All	0,98
Primary emission source proximity	1, 2	Primary emission source is not located in the breathing zone of the worker (workers are in a control room)
	3, 4, 8a, 8b, 9, 13	Primary emission source located in the breathing zone of the workers (i.e. Within 1 metre)
Activity class	1,2,3,4,8a,8b,9	Transfer of liquid products
	13	Activities with open liquid surface or reservoirs
Containment	1, 2, 3, 9	Handling reduces contact between product and adjacent air
	4	Open process, submerged loading
	8a, 8b, 13	n.a.
Localized controls	1, 2, 3, 8b	Vapour recovery system, LEV
	2, 4, 9	Vapour recovery
	8a, 13	None
Segregation	1, 2	Complete segregation of workers in separate control room
Fugitive emission sources	1, 3, 8b, 9	Process fully enclosed – not breached for sampling
	2, 4, 8a, 13	Not fully enclosed – effective housekeeping practices in place.
Dispersion	1, 2, 8a, 8b	Outdoors not close to buildings
	3, 4	Outdoors near to buildings
	9, 13	Indoors, any sized room, only good natural ventilation

The estimated short and long-term concentrations are lower than relevant DNEL for all process categories.

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3.2 Environment

Tier 1 assessment has been carried out applying EUSES model with standard input data and ERC.

Tier 1 assessment resulted a not realistic exposition.

Tier 2 assessment has been carried out applying EUSES model; refined inputs are chosen to best suit the description of the production and uses of sulfuric acid.

EUSES model input parameters

Input parameter	Value	Unit	ERC default (if applicable)
Molecular weight	98,08	g/mol	
Vapour pressure at 20°C	0,1	hPa	
Water solubility	miscible	Mg/ml	
Octanol/water partition coefficient	-1	LogKow	
Koc	1		
Biodegradability	Not biodegradable		
Life Cycle Step	Industrial use		
Environmental Release Class	ERC 6B		
Fraction of Tonnage for Region (1 Tier)			1
STP			Yes
Emission events per year	365	days	20
Default Release to Air	0,1	%	0,1
Default Release to water	5	%	5
Dilution factor applied for PEC derivation			10 (20.000 m3/d)
Tonnage assessed	10.000	tonnes/ year	

RMMs and measured values for tier 2 assessment.

Description of RMM	Details	Effect taken into account in EUSES	Comments
No loss to waste water	0 mg/l	Lowering of concentration in STP effluent to 0 mg/L due to the very efficient neutralization process	Total neutralization to around pH 7.
Emission days	365 emission days per year	Increase emission days by 20%.	Continuous production
Sludge removal	Sludge removed and sent to landfill or incinerated.	Concentration in soil due to sludge spreading set to 0.	No contamination of grassland or agricultural soil.

All estimated concentrations are lower than relevant DNEL.

Section 4 Guidance to check compliance with exposure scenario

4.1 Health

Estimated workplace exposures are not expected to exceed DNELs when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 3.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

4.2 Environment

Estimated exposures are not expected to exceed PNEC when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 2.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks

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are managed to at least equivalent levels.

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6 Use of sulfuric acid in electrolytic processes

Section 1: Title of exposure scenario	
Short title of the exposure scenario: Use of sulfuric acid in electrolytic processes	
Title systematically based on the use of descriptors	
Sector of Use: (SU)	3, 14, 15, 17
Product Category: (PC)	14, 20
Process Categories: (PROC)	1, 2, 8b, 9, 13
Environmental Release Category: (ERC)	05, 6b
Covered processes and activities	
Use of sulfuric acid in electrolytic processes includes metal refining, electroplating of zinc and electrogalvanizing of iron and steel. The electrolytic processes take place in a specially constructed vessel which contains a bath of sulfuric acid solution. Two electrical poles are located either side of the acid bath and these pass current through the electrolyte to achieve electrolysis.	
Evaluation methodology	
Refer to section 3	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product Characteristics	
Physical state	Liquid
Vapour pressure (Pa)	6
Molecular weight	98,08
Concentration of substance in product	95%-98% (This concentration is used to prepare a diluted electrolyte solution.)
Operational conditions	
Use amount per worker [workplace] per day	Worker exposure should be low and controlled
Frequency at workplace	220 d/year
Duration per day at workplace [for one worker]	8hr/d
Other determinants related to duration, frequency and amount of use	Intermittent contact is expected -
Respiration volume under conditions of use	10 m3/d (default value for a worker breathing for a 8hrs work day)
Skin contact area with the substance under conditions of use	480 cm2 (ECETOC default). Please note that due to the corrosive nature of sulfuric acid dermal exposure is not considered relevant for risk characterization as it must be prevented in all cases.
Room size and ventilation rate	n.a. (not relevant as workers work in a control room, with no direct contact to the installations housing the material)
Specific Risk management measures	
Containment plus good work practice required Local exhaust ventilation if required	Working with sulfuric acid involves, special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in the production and uses of sulfuric acid are usually housed outdoors. Electrolysis is most commonly taking place not in the open air. Any gas displaced from containers is conducted via pipeline to be processed i.e. removed and scrubbed and /or filtered.
Personal protective equipment (PPE)	Working with sulfuric acid involves, special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in the production and uses of sulfuric acid are usually housed outdoors. Any gas displaced from containers is conducted via pipeline to be processed i.e.

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	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 (gloves, respirator, face-shield, etc.) is intended to cope with the worst case scenario, in order to minimise exposure and risks. PROC 13 requires respiratory system protection at least with an efficiency of 95%.
Other risk management measures related to workers	Other measures not required
Section 2.2 Control of environmental exposure	
Product characteristics	
Molecular weight	98,08
Vapour pressure at 20°C (hPa)	0,1
Water solubility	Miscible
Octanol/water partition coefficient	-1 (logKow)
Koc	1
Biodegradability	Not biodegradable (inorganic acids cannot be considered biodegradable)
Amount of use	
Annual amount used per site	2.306 t/y (worst case site)
Frequency and duration of use	
continuous production	
Emission days	365 d/y
Other operational conditions affecting environmental exposure	
Discharge volume of sewage treatment plant	2000 m3/d (EUSES default value for standard local STP)
Available river water volume to receive the emissions from a site	20.000 m3/d (Standard ERC flow rate leading to a 10 fold dilution in receiving waters.)
Risk management measures related to environmental emissions from industrial sites	
Onsite pre-treatment of waste water	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 processed for metal recovery, incinerated or sent to landfill.
Fractions of substance in waste and waste management measures	
Amount of substances in waste water resulting from identified uses covered in the exposure scenario	0 kg/d (value based on the specialised waste water treatment procedures)
Amount of substances in waste resulting from service life of articles	n.a.
Type of waste, suitable waste codes	Suitable EWC code(s)
Type of external treatment aiming at recycling or recovery of substances	Metal recovery, incineration or landfill.
Type of external treatment aiming at final disposal of the waste	Metal recovery, incineration or landfill.
Fraction of substance released into the environment via air from waste handling	n.a.
Fraction of substance released into the environment via waste water from waste handling	n.a.
Fraction of substance disposed of as secondary waste	n.a.
Section 3 Exposure estimation	
3.1 Health	
ECETOC TRA model to conduct a Tier 1 assessment of inhalation exposure concentrations.	

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ECETOC TRA Model input parameters:

	Parameter
Molecular weight	98,08 g/ mol
Vapour pressure	6 Pa
Is the substance a solid?	No: liquid
Dustiness during process	n.a.
Duration of activity	> 4 h
Use of ventilation	Indoors without LEV

The ECETOC exposure estimation is considered to be unsatisfactory and is not considered relevant for risk characterisation purposes.

ART model to conduct a Tier 2 assessment of inhalation exposure concentrations.

ART Model input parameters:

	PROC	Parameters/assumptions
Exposure duration	All	480 mins
Product type	All	Liquid (medium viscosity – like oil)
Process temperature	1,2	Hot processes (50-150°C)
	8b, 9, 13	Room temperature (15-25°C)
Vapour pressure	All	6 Pa (Substance is considered to be low volatile, exposure to mists is estimated)
Liquid weight fraction	All	0,98
Primary emission source proximity	1,2	Primary emission source is not located in the breathing zone of the worker (workers are in a control room)
	8b, 9, 13	Primary emission source located in the breathing zone of the workers (i.e. Within 1 metre)
Activity class	1,2,3,4,8a,8b,9	Transfer of liquid products
	13	Activities with open liquid surface or reservoirs
Containment	1, 2, 9	Handling reduces contact between product and adjacent air
	8b, 13	Open process, submerged loading
Localized controls	1, 8b	Vapour recovery system, LEV
	2, 9	Vapour recovery
	13	LE
Segregation	1, 2	Complete segregation of workers in separate control room
Fugitive emission sources	1, 8b, 9	Process fully enclosed – not breached for sampling
	2, , 13	Not fully enclosed – effective housekeeping practices in place.
Dispersion	1, 2, 8a, 8b	Outdoors not close to buildings
	39, 13	Indoors, any sized room, only good natural ventilation (LEV applied when needed)

The estimated short and long-term concentrations are lower than relevant DNEL for all process categories, except

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PROC13, which requires a breathing system protection with an efficiency at least of 95%.

3.2 Environment

Tier 1 assessment has been carried out applying EUSES model with standard input data and ERC.

Tier 1 assessment resulted a not realistic exposition.

Tier 2 assessment has been carried out applying EUSES model; refined inputs are chosen to best suit the description of the production and uses of sulfuric acid.

EUSES model input parameters

Input parameter	Value	Unit	ERC default (if applicable)
Molecular weight	98,08	g/mol	
Vapour pressure at 20°C	0,1	hPa	
Water solubility	miscible	Mg/ml	
Octanol/water partition coefficient	-1	LogKow	
Koc	1		
Biodegradability	Not biodegradable		
Life Cycle Step	Industrial use		
Environmental Release Class	ERC 6B and 5		
Fraction of Tonnage for Region (1 Tier)			1
STP			Yes
Emission events per year	365	days	100
Default Release to Air	ERC 6b : 0,1 ERC 5: 50	%	ERC 6b : 0,1 ERC 5: 50
Default Release to water	ERC 6b : 5 ERC 5: 50	%	ERC 6b: 5 ERC 5: 50
Dilution factor applied for PEC derivation			10 (20.000 m3/d)
Tonnage assessed	2.306	tonnes/ year	

RMMs and measured values for tier 2 assessment.

Description of RMM	Details	Effect taken into account in EUSES	Comments
No loss to waste water	0 mg/l	Lowering of concentration in STP effluent to 0 mg/L due to the very efficient neutralization process	Total neutralization to around pH 7.
Emission days	365 emission days per year	Increase emission days by 20%.	Continuous production
Sludge removal	Sludge removed and sent to landfill or incinerated.	Concentration in soil due to sludge spreading set to 0.	No contamination of grassland or agricultural soil.

All estimated concentrations are lower than relevant DNEL.

Section 4 Guidance to check compliance with exposure scenario

4.1 Health

Estimated workplace exposures are not expected to exceed DNELs when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 3.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

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4.2 Environment

Estimated exposures are not expected to exceed PNEC when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 2.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

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7 Use of sulfuric acid in gas purification, scrubbing and flue gas scrubbing.

Section 1: Title of exposure scenario	
Short title of the exposure scenario: 7 Use of sulfuric acid in gas purification, scrubbing and flue gas scrubbing.	
Title systematically based on the use of descriptors	
Sector of Use: (SU)	3, 8
Product Category: (PC)	20
Process Categories: (PROC)	1, 2, 8b
Environmental Release Category: (ERC)	7
Covered processes and activities	
Use of concentrated sulfuric acid as agent for gas purification, including gas scrubbing and flue gas scrubbing. The main applications of this would be in purification of gas from coke ovens and in the purification and drying of industrial gases generated from the manufacture of other substances.	
Evaluation methodology	
Refer to section 3	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product Characteristics	
Physical state	Liquid
Vapour pressure (Pa)	6
Molecular weight	98,08
Concentration of substance in product	98% (Concentrated acid. Slightly diluted concentrations may also be used)
Operational conditions	
Use amount per worker [workplace] per day	Worker exposure should be low and controlled
Frequency at workplace	220 d/year
Duration per day at workplace [for one worker]	8hr/d
Other determinants related to duration, frequency and amount of use	Intermittent contact is expected -
Respiration volume under conditions of use	10 m3/d (default value for a worker breathing for a 8hrs work day)
Skin contact area with the substance under conditions of use	480 cm2 (ECETOC default). Please note that due to the corrosive nature of sulfuric acid dermal exposure is not considered relevant for risk characterization as it must be prevented in all cases.
Room size and ventilation rate	n.a. (not relevant as workers work in a control room, with no direct contact to the installations housing the material)
Specific Risk management measures	
Containment plus good work practice required Local exhaust ventilation if required	The processes associated with sulfuric acid involve special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in the production and uses of sulfuric 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)	Use of sulfuric acid involves special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in the production and uses of sulfuric 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

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	protective equipment (chemical resistant clothing, goggles and respiratory equipment, face-shield, etc.) is intended to cope with the worst case scenario, in order to minimise exposure and risks.
Other risk management measures related to workers	A safety shower is required nearby loading and unloading areas in case of accidental spillage.
Section 2.2 Control of environmental exposure	
Product characteristics	
Molecular weight	98,08
Vapour pressure at 20°C (hPa)	0,1
Water solubility	Miscible
Octanol/water partition coefficient	-1 (logKow)
Koc	1
Biodegradability	Not biodegradable (inorganic acids cannot be considered biodegradable)
Amount of use	
Annual amount used per site	30.000 t/y (worst case site. In addition to this amount one company has quoted an emission of around 1.5 tonnes per day direct to surface water after contamination removal).
Frequency and duration of use	
continuous production	
Emission days	365 d/y
Other operational conditions affecting environmental exposure	
Discharge volume of sewage treatment plant	2000 m3/d (EUSES default value for standard local STP)
Available river water volume to receive the emissions from a site	20.000 m3/d (Standard ERC flow rate leading to a 10 fold dilution in receiving waters.)
Risk management measures related to environmental emissions from industrial sites	
Onsite pre-treatment of waste water	Waste waters are generally treated on site by chemical and/or biological methods before release to the municipal STP or to the environment. Spent acid solutions are neutralized to circumneutral pH prior to discharge.
Recovery of sludge for agriculture or horticulture	No, all sludge is collected and incinerated or sent to landfill.
Fractions of substance in waste and waste management measures	
Amount of substances in waste water resulting from identified uses covered in the exposure scenario	0 kg/d (value based on the specialised waste water treatment procedures)
Amount of substances in waste resulting from service life of articles	n.a.
Type of waste, suitable waste codes	Suitable EWC code(s)
Type of external treatment aiming at recycling or recovery of substances	None
Type of external treatment aiming at final disposal of the waste	Incineration or landfill.
Fraction of substance released into the environment via air from waste handling	n.a.
Fraction of substance released into the environment via waste water from waste handling	n.a.
Fraction of substance disposed of as secondary waste	n.a.
Section 3 Exposure estimation	

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3.1 Health

ECETOC TRA model to conduct a Tier 1 assessment of inhalation exposure concentrations.

ECETOC TRA Model input parameters:

	Parameter
Molecular weight	98,08 g/ mol
Vapour pressure	6 Pa
Is the substance a solid?	No: liquid
Dustiness during process	n.a.
Duration of activity	> 4 h
Use of ventilation	Indoors without LEV

The ECETOC exposure estimation is considered to be unsatisfactory and is not considered relevant for risk characterisation purposes.

ART model to conduct a Tier 2 assessment of inhalation exposure concentrations.

ART Model input parameters:

	PROC	Parameters/assumptions
Exposure duration	All	480 mins
Product type	All	Liquid (medium viscosity – like oil)
Process temperature	All	Hot temperature (50-150°C)
Vapour pressure	All	6 Pa (Substance is considered to be low volatile, exposure to mists is estimated)
Liquid weight fraction	All	0,98
Primary emission source proximity	1, 2	Primary emission source is not located in the breathing zone of the worker (workers are in a control room)
	8b	Primary emission source located in the breathing zone of the workers (i.e. Within 1 metre)
Activity class	All	Transfer of liquid products
Containment	1, 2	Handling reduces contact between product and adjacent air
	8b	n.a.
Localized controls	1, 8b	Vapour recovery system, LEV
	2	Vapour recovery
Segregation	1, 2	Complete segregation of workers in separate control room
Fugitive emission sources	1, 8b	Process fully enclosed – not breached for sampling
	2	Not fully enclosed – effective housekeeping practices in place.
Dispersion	1, 2, 8b	Outdoors not close to buildings

The estimated short and long-term concentrations are lower than relevant DNEL for all process categories.

3.2 Environment

Tier 1 assessment has been carried out applying EUSES model with standard input data and ERC.

Tier 1 assessment resulted a not realistic exposition.

Tier 2 assessment has been carried out applying EUSES model; refined inputs are chosen to best suit the description

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of the production and uses of sulfuric acid.

EUSES model input parameters

Input parameter	Value	Unit	ERC default (if applicable)
Molecular weight	98,08	g/mol	
Vapour pressure at 20°C	0,1	hPa	
Water solubility	miscible	Mg/ml	
Octanol/water partition coefficient	-1	LogKow	
Koc	1		
Biodegradability	Not biodegradable		
Life Cycle Step	Industrial use		
Environmental Release Class	ERC 7		
Fraction of Tonnage for Region (1 Tier)			1
STP			Yes
Emission events per year	365	days	300
Default Release to Air	5	%	5
Default Release to water	5	%	5
Dilution factor applied for PEC derivation			10 (20.000 m3/d)
Tonnage assessed	30,000 (560 tonnes per year emitted to surface water directly in one case)	tonnes/ year	

RMMs and measured values for tier 2 assessment.

Description of RMM	Details	Effect taken into account in EUSES	Comments
No loss to waste water	0 mg/l (emission to large river with a pH of 8 and a flow rate of 2000 m3/sec)	Lowering of concentration in STP effluent to 0 mg/L due to the very efficient neutralization process (Dealt with in a qualitative manner)	Total neutralization to around pH 7. (capacity of the river expected to sufficiently dilute any emissions of sulfate species).
Emission days	365 emission days per year	Increase emission days by 20%.	Continuous production
Sludge removal	Sludge removed and sent to landfill or incinerated.	Concentration in soil due to sludge spreading set to 0.	No contamination of grassland or agricultural soil.

All estimated concentrations are lower than relevant DNEL.

Section 4 Guidance to check compliance with exposure scenario

4.1 Health

Estimated workplace exposures are not expected to exceed DNELs when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 3.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

4.2 Environment

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Estimated exposures are not expected to exceed PNEC when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 2.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

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8 Use of sulfuric acid in production of sulfuric acid contained batteries

Section 1: Title of exposure scenario	
Short title of the exposure scenario: Use of sulfuric acid in production of sulfuric acid contained batteries	
Title systematically based on the use of descriptors	
Sector of Use: (SU)	3
Product Category: (PC)	0
Process Categories: (PROC)	2, 3, 4, 9
Environmental Release Category: (ERC)	2, 5
Covered processes and activities	
Use of sulfuric acid in the production of the liquid electrolyte in the production of lead-acid batteries.	
Evaluation methodology	
Refer to section 3	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product Characteristics	
Physical state	Liquid
Vapour pressure (Pa)	6
Molecular weight	98,08
Concentration of substance in product	98% (Concentrated acid. Slightly diluted concentrations may also be used)
Operational conditions	
Use amount per worker [workplace] per day	Worker exposure should be low and controlled
Frequency at workplace	220 d/year
Duration per day at workplace [for one worker]	8hr/d
Other determinants related to duration, frequency and amount of use	Intermittent contact is expected -
Respiration volume under conditions of use	10 m3/d (default value for a worker breathing for a 8hrs work day)
Skin contact area with the substance under conditions of use	480 cm2 (ECETOC default). Please note that due to the corrosive nature of sulfuric acid dermal exposure is not considered relevant for risk characterization as it must be prevented in all cases.
Room size and ventilation rate	n.a. (not relevant as workers work in a control room, with no direct contact to the installations housing the material)
Specific Risk management measures	
Containment plus good work practice required Local exhaust ventilation if required	Working with sulfuric acid involves special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in the production and uses of sulfuric 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)	Working with sulfuric acid involves special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in the production and uses of sulfuric 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 (chemical resistant clothing, goggles and respiratory

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	equipment, face-shield, etc.) is intended to cope with the worst case scenario, in order to minimise exposure and risks.
Other risk management measures related to workers	A safety shower is required nearby loading and unloading areas in case of accidental spillage.
Section 2.2 Control of environmental exposure	
Product characteristics	
Molecular weight	98,08
Vapour pressure at 20°C (hPa)	0,1
Water solubility	Miscible
Octanol/water partition coefficient	-1 (logKow)
Koc	1
Biodegradability	Not biodegradable (inorganic acids cannot be considered biodegradable)
Amount of use	
Annual amount used per site	2.500 t/y (worst case site)
Frequency and duration of use	
continuous production	
Emission days	365 d/y
Other operational conditions affecting environmental exposure	
Discharge volume of sewage treatment plant	2000 m3/d (EUSES default value for standard local STP)
Available river water volume to receive the emissions from a site	20.000 m3/d (Standard ERC flow rate leading to a 10 fold dilution in receiving waters.)
Risk management measures related to environmental emissions from industrial sites	
Onsite pre-treatment of waste water	Waste waters are generally treated on site by chemical and/or biological methods before release to the municipal STP or to the environment.
Resulting fraction of initially applied amount in waste water released from site	Removal by neutralization has been considered.
Recovery of sludge for agriculture or horticulture	No, all sludge is collected and incinerated or sent to landfill.
Fractions of substance in waste and waste management measures	
Amount of substances in waste water resulting from identified uses covered in the exposure scenario	0 kg/d (value based on the specialised waste water treatment procedures)
Amount of substances in waste resulting from service life of articles	n.a.
Type of waste, suitable waste codes	Suitable EWC code(s)
Type of external treatment aiming at recycling or recovery of substances	None
Type of external treatment aiming at final disposal of the waste	Incineration or landfill.
Fraction of substance released into the environment via air from waste handling	n.a.
Fraction of substance released into the environment via waste water from waste handling	n.a.
Fraction of substance disposed of as secondary waste	n.a.
Section 3 Exposure estimation	
3.1 Health	
ECETOC TRA model to conduct a Tier 1 assessment of inhalation exposure concentrations. ECETOC TRA Model input parameters:	

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	Parameter
Molecular weight	98,08 g/ mol
Vapour pressure	6 Pa
Is the substance a solid?	No: liquid
Dustiness during process	n.a.
Duration of activity	> 4 h
Use of ventilation	Indoors without LEV

The ECETOC exposure estimation is considered to be unsatisfactory and is not considered relevant for risk characterisation purposes.

ART model to conduct a Tier 2 assessment of inhalation exposure concentrations.

ART Model input parameters:

	PROC	Parameters/assumptions
Exposure duration	All	480 mins
Product type	2, 3	Liquid (medium viscosity – like oil)
	4, 9	Liquid (low viscosity – like water)
Process temperature	All	Room temperature (15-25°C)
Vapour pressure	All	6 Pa (Substance is considered to be low volatile, exposure to mists is estimated)
Liquid weight fraction	2, 3	0,98
	4, 9	0,25
Primary emission source proximity	All	Primary emission source located in the breathing zone of the workers (i.e. Within 1 metre)
Activity class	All	Transfer of liquid products
Containment	All	Handling reduces contact between product and adjacent air
Localized controls	All	Vapour recovery system, LEV
Segregation	n.a.	n.a.
Fugitive emission sources	2	Process fully enclosed – not breached for sampling
	3, 4, 9	Not fully enclosed – effective housekeeping practices in place.
Dispersion	All	Indoors, any sized room, only good natural ventilation

The estimated short and long-term concentrations are lower than relevant DNEL for all process categories.

3.2 Environment

Tier 1 assessment has been carried out applying EUSES model with standard input data and ERC.

Tier 1 assessment resulted a not realistic exposition.

Tier 2 assessment has been carried out applying EUSES model; refined inputs are chosen to best suit the description of the production and uses of sulfuric acid.

EUSES model input parameters

Input parameter	Value	Unit	ERC default (if applicable)
Molecular weight	98,08	g/mol	

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Vapour pressure at 20°C	0,1	hPa	
Water solubility	miscible	Mg/ml	
Octanol/water partition coefficient	-1	LogKow	
Koc	1		
Biodegradability	Not biodegradable		
Life Cycle Step	Industrial use		
Environmental Release Class	ERC 2, 5		
Fraction of Tonnage for Region (1 Tier)			1
STP			Yes
Emission events per year	365	days	20
Default Release to Air	ERC2: 2,5 ERC5: 5,0	%	ERC2: 2,5 ERC5: 5,0
Default Release to water	ERC2: 2 ERC5: 50	%	ERC2: 2 ERC5: 50
Dilution factor applied for PEC derivation			10 (20.000 m3/d)
Tonnage assessed	2.500	tonnes/ year	

RMMs and measured values for tier 2 assessment.

Description of RMM	Details	Effect taken into account in EUSES	Comments
No loss to waste water	0 mg/l	Lowering of concentration in STP effluent to 0 mg/L due to the very efficient neutralization process	Total neutralization to around pH 7.
Emission days	365 emission days per year	Increase emission days by 20%.	Continuous production
Sludge removal	Sludge removed and sent to landfill or incinerated.	Concentration in soil due to sludge spreading set to 0.	No contamination of grassland or agricultural soil.

All estimated concentrations are lower than relevant DNEL.

Section 4 Guidance to check compliance with exposure scenario

4.1 Health

Estimated workplace exposures are not expected to exceed DNELs when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 3.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

4.2 Environment

Estimated exposures are not expected to exceed PNEC when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 2.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

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9. Use of sulfuric acid in maintenance of sulfuric acid contained batteries

Section 1: Title of exposure scenario	
Short title of the exposure scenario: Use of sulfuric acid in maintenance of sulfuric acid contained batteries	
Title systematically based on the use of descriptors	
Sector of Use: (SU)	22
Product Category: (PC)	0
Process Categories: (PROC)	19
Environmental Release Category: (ERC)	8b, 9b
Covered processes and activities	
Use of sulfuric acid in the maintenance of lead-acid batteries.	
Evaluation methodology	
Refer to section 3	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product Characteristics	
Physical state	Liquid
Vapour pressure (Pa)	214 (for dilute electrolyte solution - based on data for the most dilute mixture available)
Molecular weight	98,08
Concentration of substance in product	From 25% to 40%
Operational conditions	
Use amount per worker [workplace] per day	Worker exposure considered to be negligible due to specialised systems.
Frequency at workplace	220 d/year
Duration per day at workplace [for one worker]	8hr/d
Other determinants related to duration, frequency and amount of use	Intermittent contact is expected - As batteries are sealed articles with a long service life maintenance is required only rarely. These tasks rarely take a full 8hr / day so worst case is assumed.
Respiration volume under conditions of use	10 m3/d (default value for a worker breathing for a 8hrs work day)
Skin contact area with the substance under conditions of use	480 cm2 (ECETOC default). Please note that due to the corrosive nature of sulfuric acid dermal exposure is not considered relevant for risk characterization as it must be prevented in all cases.
Room size and ventilation rate	n.a. (loading and unloading of vessels of sulfuric acid for use in maintenance of batteries is usually performed in the open air)
Specific Risk management measures	
Containment plus good work practice required Local exhaust ventilation if required	n.a. (loading and unloading of vessels of sulfuric acid for use in maintenance of batteries is usually performed in the open air)
Personal protective equipment (PPE)	Workers wear protective clothing (face/eye protection, helmet, anti-acid gloves boots and protective overall). Maintenance of batteries is generally carried out by trained technicians in facilities with exposure and waste treatment procedures in place.
Other risk management measures related to workers	A safety shower is required nearby loading and unloading areas in case of accidental spillage.
Section 2.2 Control of environmental exposure	
Product characteristics	

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Molecular weight	98,08
Vapour pressure at 20°C (hPa)	0,1
Water solubility	Miscible
Octanol/water partition coefficient	-1 (logKow)
Koc	1
Biodegradability	Not biodegradable (inorganic acids cannot be considered biodegradable)
Amount of use	
Annual amount used per site	2.500 t/y (worst case site)
Frequency and duration of use	
continuous production	
Emission days	365 d/y
Other operational conditions affecting environmental exposure	
Discharge volume of sewage treatment plant	2000 m3/d (EUSES default value for standard local STP)
Available river water volume to receive the emissions from a site	20.000 m3/d (Standard ERC flow rate leading to a 10 fold dilution in receiving waters.)
Risk management measures related to environmental emissions from industrial sites	
None required to demonstrate safe use	
Fractions of substance in waste and waste management measures	
Amount of substances in waste water resulting from identified uses covered in the exposure scenario	342 kg/d (based on worst case estimated emission to waste waters identified)
Amount of substances in waste resulting from service life of articles	n.a.
Type of waste, suitable waste codes	Suitable EWC code(s)
Type of external treatment aiming at recycling or recovery of substances	None. Degradation in the STP into constituent ions. These are non hazardous.
Type of external treatment aiming at final disposal of the waste	Incineration or landfill.
Fraction of substance released into the environment via air from waste handling	n.a.
Fraction of substance released into the environment via waste water from waste handling	n.a.
Fraction of substance disposed of as secondary waste	n.a.
Section 3 Exposure estimation	
3.1 Health	
ECETOC TRA model to conduct a Tier 1 assessment of inhalation exposure concentrations. ECETOC TRA Model input parameters:	
	Parameter
Molecular weight	98,08 g/ mol
Vapour pressure	214 Pa (for dilute electrolyte solution (based on data for the most dilute mixture available).
Is the substance a solid?	No: liquid
Dustiness during process	n.a.
Duration of activity	> 4 h
Use of ventilation	Indoors without LEV
The ECETOC exposure estimation is considered to be unsatisfactory and is not considered relevant for risk	

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characterisation purposes.

ART model to conduct a Tier 2 assessment of inhalation exposure concentrations.

ART Model input parameters:

	PROC	Parameters/assumptions
Exposure duration	19	240 mins exposure– 240 mins non-exposure
Product type	19	Liquid (low viscosity – like water)
Process temperature	19	Room temperature (15-25°C)
Vapour pressure	19	Substance is considered to be low volatile, exposure to mists is estimated
Liquid weight fraction	19	0,25
Primary emission source proximity	19	Primary emission source located in the breathing zone of the workers (i.e. Within 1 metre)
Activity class	19	Handling of contaminated objects
Localized controls	19	None
Fugitive emission sources	19	Not fully enclosed – effective housekeeping practices in place.
Dispersion	19	Indoors, any sized room, only good natural ventilation

The estimated short and long-term concentrations are lower than relevant DNEL for all process categories.

3.2 Environment

Tier 1 assessment has been carried out applying EUSES model with standard input data and ERC.

Tier 1 assessment resulted a not realistic exposition.

Tier 2 assessment has been carried out applying EUSES model; refined inputs are chosen to best suit the description of the production and uses of sulfuric acid.

EUSES model input parameters

Input parameter	Value	Unit	ERC default (if applicable)
Molecular weight	98,08	g/mol	
Vapour pressure at 20°C	0,1	hPa	
Water solubility	miscible	Mg/ml	
Octanol/water partition coefficient	-1	LogKow	
Koc	1		
Biodegradability	Not biodegradable		
Life Cycle Step	Wide dispersive use		
Environmental Release Class	ERC 8b, 9b		
Fraction of Tonnage for Region (1 Tier)			1
STP			Yes
Emission events per year	365 (chosen as it is likely that battery maintenance will be carried out at some site within the region on most days due to the small scale but wide dispersive nature of this use)	days	365

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Default Release to Air	ERC8b: 0,1 ERC9b: 5,0	%	ERC8b: 0,1 ERC9b: 5,0
Default Release to water	ERC2: 2 ERC5: 5	%	ERC2: 2 ERC5: 5
Dilution factor applied for PEC derivation			25*10 ⁹ m3/y (wide dispersive)
Tonnage assessed	2.500	tonnes/ year	stimate of single site use

RMMs and measured values for tier 2 assessment.
Not applicable (tier 2 assessment not necessary).

All estimated concentrations are lower than relevant DNEL.

Section 4 Guidance to check compliance with exposure scenario

4.1 Health

Estimated workplace exposures are not expected to exceed DNELs when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 3.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

4.2 Environment

Estimated exposures are not expected to exceed PNEC when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 2.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

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10. 0 Use of sulfuric acid in recycling of sulfuric acid contained batteries

Section 1: Title of exposure scenario	
Short title of the exposure scenario: Use of sulfuric acid in recycling of sulfuric acid contained batteries	
Title systematically based on the use of descriptors	
Sector of Use: (SU)	3
Product Category: (PC)	0
Process Categories: (PROC)	2, 4, 5, 8a
Environmental Release Category: (ERC)	1
Covered processes and activities	
<p>The use encompasses the management of sulfuric acid electrolyte in battery recycling.</p> <p>The process of battery recycling is aimed at recovery of the lead from the battery plates and removal of the sulfuric acid electrolyte solution. The batteries are mechanically crushed using, for example, a hydraulic press, and the electrolyte is drained and collected. Recovered acid may be reused for some applications or can be neutralized and treated to remove contaminants and disposed.</p>	
Evaluation methodology	
Refer to section 3	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product Characteristics	
Physical state	Liquid
Vapour pressure (Pa)	214 (For dilute electrolyte solution - based on data for the most dilute mixture available).
Molecular weight	98,08
Concentration of substance in product	from 25% to 40%
Operational conditions	
Use amount per worker [workplace] per day	Worker exposure considered to be negligible due to specialised systems.
Frequency at workplace	220 d/year
Duration per day at workplace [for one worker]	8hr/d
Other determinants related to duration, frequency and amount of use	Intermittent contact is expected - As batteries are sealed articles with a long service life maintenance is required only rarely. These tasks rarely take a full 8hr / day so worst case is assumed.
Respiration volume under conditions of use	10 m ³ /d (default value for a worker breathing for a 8hrs work day)
Skin contact area with the substance under conditions of use	480 cm ² (ECETOC default). Please note that due to the corrosive nature of sulfuric acid dermal exposure is not considered relevant for risk characterization as it must be prevented in all cases.
Room size and ventilation rate	n.a. (loading and unloading of vessels of sulfuric acid for use in maintenance of batteries is usually performed in the open air)
Specific Risk management measures	
Containment plus good work practice required Local exhaust ventilation if required	Loading and unloading of vessels of sulfuric acid for use in maintenance of batteries is usually performed in the open air. Workers wear protective clothing (face/eye protection, helmet, anti anti-acid gloves boots and protective overall).
Personal protective equipment (PPE)	Workers wear protective clothing (face/eye protection, helmet, anti anti-acid gloves boots and protective overall).
Other risk management measures related to workers	A safety shower is required nearby loading and unloading areas in case of accidental spillage.

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Section 2.2 Control of environmental exposure	
Product characteristics	
Molecular weight	98,08
Vapour pressure at 20°C (hPa)	0,1
Water solubility	Miscible
Octanol/water partition coefficient	-1 (logKow)
Koc	1
Biodegradability	Not biodegradable (inorganic acids cannot be considered biodegradable)
Amount of use	
Annual amount used per site	2.500 t/y (worst case site)
Frequency and duration of use	
continuous production	
Emission days	365 d/y
Other operational conditions affecting environmental exposure	
Discharge volume of sewage treatment plant	2000 m3/d (EUSES default value for standard local STP)
Available river water volume to receive the emissions from a site	20.000 m3/d (Standard ERC flow rate leading to a 10 fold dilution in receiving waters.)
Risk management measures related to environmental emissions from industrial sites	
Onsite pre-treatment of waste water	Waste waters are generally treated on site by chemical and/or biological methods before release to the municipal STP or to the environment. Extracted acid may also be collected and re-used.
Recovery of sludge for agriculture or horticulture	No, all sludge is collected and incinerated or sent to landfill.
Fractions of substance in waste and waste management measures	
Amount of substances in waste water resulting from identified uses covered in the exposure scenario	0 kg/d (value based on the specialised waste water treatment procedures)
Amount of substances in waste resulting from service life of articles	n.a.
Type of waste, suitable waste codes	Suitable EWC code(s)
Type of external treatment aiming at recycling or recovery of substances	None
Type of external treatment aiming at final disposal of the waste	Incineration or landfill.
Fraction of substance released into the environment via air from waste handling	n.a.
Fraction of substance released into the environment via waste water from waste handling	n.a.
Fraction of substance disposed of as secondary waste	n.a.
Section 3 Exposure estimation	
3.1 Health	
ECETOC TRA model to conduct a Tier 1 assessment of inhalation exposure concentrations. ECETOC TRA Model input parameters:	
	Parameter
Molecular weight	98,08 g/ mol
Vapour pressure	214 Pa (for dilute electrolyte solution - based on data for the most dilute mixture available).
Is the substance a solid?	No: liquid

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Dustiness during process	n.a.
Duration of activity	> 4 h
Use of ventilation	Indoors without LEV

The ECETOC exposure estimation is considered to be unsatisfactory and is not considered relevant for risk characterisation purposes.

ART model to conduct a Tier 2 assessment of inhalation exposure concentrations.

ART Model input parameters:

	PROC	Parameters/assumptions
Exposure duration	All	480 mins
Product type	All	Liquid (low viscosity – like water)
Process temperature	All	Room temperature (15-25°C)
Vapour pressure	All	Substance is considered to be low volatile, exposure to mists is estimated
Liquid weight fraction	All	0,25
Primary emission source proximity	All	Primary emission source located in the breathing zone of the workers (i.e. Within 1 metre)
Activity class	2, 4	Transfer of liquid products
	2, 4, 8a	Transfer of liquid products – falling liquids, 1-10 L/min
	5	Activities with open surfaces
Containment	2	Handling reduces contact between product and adjacent air
	8a	Handling reduces contact between product and adjacent air – submerged loading
	4	Open process – submerged loading
	5	n.a.
Localized controls	All	LEV
Fugitive emission sources	All	Not fully enclosed – effective housekeeping practices in place.
Dispersion	All	Indoors, any sized room, only good natural ventilation

The estimated short and long-term concentrations are lower than relevant DNEL for all process categories.

3.2 Environment

Tier 1 assessment has been carried out applying EUSES model with standard input data and ERC.

Tier 1 assessment resulted a not realistic exposition.

Tier 2 assessment has been carried out applying EUSES model; refined inputs are chosen to best suit the description of the production and uses of sulfuric acid.

EUSES model input parameters

Input parameter	Value	Unit	ERC default (if applicable)
Molecular weight	98,08	g/mol	
Vapour pressure at 20°C	0,1	hPa	
Water solubility	miscible	Mg/ml	

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Octanol/water partition coefficient	-1	LogKow	
Koc	1		
Biodegradability	Not biodegradable		
Life Cycle Step	Industrial use (recycling)		
Environmental Release Class	ERC 1		
Fraction of Tonnage for Region (1 Tier)			1
STP			Yes
Emission events per year	365	days	100
Default Release to Air	5	%	5
Default Release to water	6	%	6
Dilution factor applied for PEC derivation			10 (20.000 m3/d)
Tonnage assessed	2.500	tonnes/ year	

RMMs and measured values for tier 2 assessment.

Description of RMM	Details	Effect taken into account in EUSES	Comments
No loss to waste water	0 mg/l	Lowering of concentration in STP effluent to 0 mg/L due to the very efficient neutralization process	Total neutralization to around pH 7.
Emission days	365 emission days per year	Increase emission days by 20%.	Continuous production
Sludge removal	Sludge removed and sent to landfill or incinerated.	Concentration in soil due to sludge spreading set to 0.	No contamination of grassland or agricultural soil.

All estimated concentrations are lower than relevant DNEL.

Section 4 Guidance to check compliance with exposure scenario

4.1 Health

Estimated workplace exposures are not expected to exceed DNELs when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 3. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

4.2 Environment

Estimated exposures are not expected to exceed PNEC when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 2. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

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11. Use of sulfuric acid contained batteries

Section 1: Title of exposure scenario	
Short title of the exposure scenario: Use of sulfuric acid contained batteries	
Title systematically based on the use of descriptors	
Sector of Use: (SU)	21
Product Category: (PC)	AC3
Process Categories: (PROC)	PROC19
Environmental Release Category: (ERC)	9b
Covered processes and activities	
It encompasses the use of sulfuric acid in battery maintenance by the consumer in the form of DIY battery maintenance/top-up kits.	
Evaluation methodology	
Refer to section 3	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product Characteristics	
Physical state	Liquid
Vapour pressure (Pa)	214 (For dilute electrolyte solution)
Molecular weight	98,08
Concentration of substance in product	from 25% to 40%
Operational conditions	
Use amount per worker [workplace] per day	Not applicable as this task is carried out sporadically by the consumer
Frequency at workplace	220 d/year
Duration per day at workplace [for one worker]	8hr/d
Other determinants related to duration, frequency and amount of use	Intermittent contact is expected - As batteries are sealed articles with a long service life maintenance is required only rarely.
Respiration volume under conditions of use	10 m3/d (default value for a worker breathing for a 8hrs work day)
Skin contact area with the substance under conditions of use	480 cm2 (ECETOC default). Please note that due to the corrosive nature of sulfuric acid dermal exposure is not considered relevant for risk characterization as it must be prevented in all cases.
Room size and ventilation rate	n.a. (loading and unloading of vessels of sulfuric acid for use in maintenance of batteries is usually performed in the open air)
Specific Risk management measures	
Containment plus good work practice required Local exhaust ventilation if required	Loading and unloading of vessels of sulfuric acid for use in maintenance of batteries is usually performed in the open air. Consumers are advised to wear protective clothing, however, the worst case assumption is that no localised controls are used in the process.
Personal protective equipment (PPE)	Loading and unloading of vessels of sulfuric acid for use in maintenance of batteries is usually performed in the open air. Consumers are advised to wear protective clothing, however, the worst case assumption is that no localised controls are used in the process.
Other risk management measures related to workers	No further risk management measures required
Section 2.2 Control of environmental exposure	

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Product characteristics	
Molecular weight	98,08
Vapour pressure at 20°C (hPa)	0,1
Water solubility	Miscible
Octanol/water partition coefficient	-1 (logKow)
Koc	1
Biodegradability	Not biodegradable (inorganic acids cannot be considered biodegradable)
Amount of use	
Annual amount used per site	2.500 t/y (worst case site)
Frequency and duration of use	
continuous production	
Emission days	365 d/y
Other operational conditions affecting environmental exposure	
Discharge volume of sewage treatment plant	2000 m3/d (EUSES default value for standard local STP)
Available river water volume to receive the emissions from a site	20.000 m3/d (Standard ERC flow rate leading to a 10 fold dilution in receiving waters.)
Risk management measures related to environmental emissions from industrial sites	
For this wide dispersive use particular risk management measures are not needed to demonstrate environmental safe use.	
Fractions of substance in waste and waste management measures	
Amount of substances in waste water resulting from identified uses covered in the exposure scenario	34,2 kg/d (based on worst case estimated emission to waste waters identified)
Amount of substances in waste resulting from service life of articles	n.a.
Type of waste, suitable waste codes	Suitable EWC code(s)
Type of external treatment aiming at recycling or recovery of substances	None
Type of external treatment aiming at final disposal of the waste	Degradation in the STP into constituent ions. These are non hazardous.
Fraction of substance released into the environment via air from waste handling	n.a.
Fraction of substance released into the environment via waste water from waste handling	n.a.
Fraction of substance disposed of as secondary waste	n.a.
Section 3 Exposure estimation	
3.1 Health	
ECETOC TRA model to conduct a Tier 1 assessment of inhalation exposure concentrations. ECETOC TRA Model input parameters:	
	Parameter
Molecular weight	98,08 g/ mol
Vapour pressure	214 Pa (for dilute electrolyte solution - based on data for the most dilute mixture available).
Is the substance a solid?	No: liquid
Dustiness during process	n.a.
Duration of activity	From 15 mins to 1 hour
Use of ventilation	Indoors without LEV
The ECETOC exposure estimation is considered to be unsatisfactory and is not considered relevant for risk	

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characterisation purposes.

ART model to conduct a Tier 2 assessment of inhalation exposure concentrations.

ART Model input parameters:

	PROC	Parameters/assumptions
Exposure duration	19	240 mins exposure / day; 240 mins non-exposure/day
Product type	19	Liquid (low viscosity – like water)
Process temperature	19	Room temperature (15-25°C)
Vapour pressure	19	Substance is considered to be low volatile, exposure to mists is estimated
Liquid weight fraction	19	0,25
Primary emission source proximity	19	Primary emission source located in the breathing zone of the workers (i.e. Within 1 metre)
Activity class	19	Handling of contaminated objects
Localized controls	19	None
Fugitive emission sources	19	Not fully enclosed – effective housekeeping practices in place.
Dispersion	19	Indoors, any sized room, only good natural ventilation

The estimated short and long-term concentrations are lower than relevant DNEL for all process categories.

3.2 Environment

Tier 1 assessment has been carried out applying EUSES model with standard input data and ERC.

Tier 1 assessment resulted a not realistic exposition.

Tier 2 assessment has been carried out applying EUSES model; refined inputs are chosen to best suit the description of the production and uses of sulfuric acid.

EUSES model input parameters

Input parameter	Value	Unit	ERC default (if applicable)
Molecular weight	98,08	g/mol	
Vapour pressure at 20°C	0,1	hPa	
Water solubility	miscible	Mg/ml	
Octanol/water partition coefficient	-1	LogKow	
Koc	1		
Biodegradability	Not biodegradable		
Life Cycle Step	Wide dispersive use		
Environmental Release Class	ERC 9b		
Fraction of Tonnage for Region (1 Tier)			1
STP			Yes
Emission events per year	365 (chosen as it is likely that battery maintenance will be carried out at some site within the region on most days due to the small scale but wide dispersive nature of this use)	days	365

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Default Release to Air	5	%	5
Default Release to water	5	%	5
Dilution factor applied for PEC derivation			25 * 10 ⁹ m3/d
Tonnage assessed	2.500	tonnes/ year	Estimate of single site use

RMMs and measured values for tier 2 assessment.
Not applicable (tier 2 assessment not necessary).

All estimated concentrations are lower than relevant DNEL.

Section 4 Guidance to check compliance with exposure scenario

4.1 Health

Estimated workplace exposures are not expected to exceed DNELs when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 3.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

4.2 Environment

Estimated exposures are not expected to exceed PNEC when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 2.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

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12. Use of sulfuric acid as laboratory chemicals

Section 1: Title of exposure scenario	
Short title of the exposure scenario: Use of sulfuric acid as laboratory chemicals	
Title systematically based on the use of descriptors	
Sector of Use: (SU)	22
Product Category: (PC)	21
Process Categories: (PROC)	15
Environmental Release Category: (ERC)	8a, 8b
Covered processes and activities	
It is covered the use of sulfuric acid as a laboratory chemical. These uses would be on a small scale R and D basis and would include use in buffers, in protein reagents and as acidification reagents.	
Evaluation methodology	
Refer to section 3	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product Characteristics	
Physical state	Liquid
Vapour pressure (Pa)	6
Molecular weight	98,08
Concentration of substance in product	98%
Operational conditions	
Use amount per worker [workplace] per day	Worker exposure considered to be negligible due to specialised systems.
Frequency at workplace	220 d/year
Duration per day at workplace [for one worker]	8hr/d
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.
Respiration volume under conditions of use	10 m3/d (default value for a worker breathing for a 8hrs work day)
Skin contact area with the substance under conditions of use	480 cm2 (ECETOC default). Please note that due to the corrosive nature of sulfuric acid dermal exposure is not considered relevant for risk characterization as it must be prevented in all cases.
Room size and ventilation rate	n.a.
Specific Risk management measures	
Containment plus good work practice required Local exhaust ventilation if required	Uses would generally be on a smaller scale and would be expected to be highly contained. Laboratory workers involved in handling and use of sulfuric acid are trained in the procedures and protective equipment is intended to cope with the worst case scenario, in order to minimise exposure and risks.
Personal protective equipment (PPE)	Uses would generally be on a smaller scale and would be expected to be highly contained. Laboratory workers involved in handling and use of sulfuric acid are trained in the procedures and protective equipment is intended to cope with the worst case scenario, in order to minimise exposure and risks.
Section 2.2 Control of environmental exposure	
Product characteristics	

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Molecular weight	98,08
Vapour pressure at 20°C (hPa)	0,1
Water solubility	Miscible
Octanol/water partition coefficient	-1 (logKow)
Koc	1
Biodegradability	Not biodegradable (inorganic acids cannot be considered biodegradable)
Amount of use	
Annual amount used per site	5.000 t/y (worst case site)
Frequency and duration of use	
continuous production	
Emission days	365 d/y (based on continuous use in at least one site per day in any particular catchment - wide dispersive use)
Other operational conditions affecting environmental exposure	
Discharge volume of sewage treatment plant	2000 m3/d (EUSES default value for standard local STP)
Available river water volume to receive the emissions from a site	20.000 m3/d (Standard ERC flow rate leading to a 10 fold dilution in receiving waters.)
Risk management measures related to environmental emissions from industrial sites	
For this wide dispersive use particular risk management measures are not needed to demonstrate environmental safe use.	
Fractions of substance in waste and waste management measures	
Amount of substances in waste water resulting from identified uses covered in the exposure scenario	1.370 kg/d (based on worst case emission to waste waters identified)
Amount of substances in waste resulting from service life of articles	n.a.
Type of waste, suitable waste codes	Suitable EWC code(s)
Type of external treatment aiming at recycling or recovery of substances	None
Type of external treatment aiming at final disposal of the waste	Incineration or landfill.
Fraction of substance released into the environment via air from waste handling	n.a.
Fraction of substance released into the environment via waste water from waste handling	n.a.
Fraction of substance disposed of as secondary waste	n.a.
Section 3 Exposure estimation	
3.1 Health	
ECETOC TRA model to conduct a Tier 1 assessment of inhalation exposure concentrations. ECETOC TRA Model input parameters:	
	Parameter
Molecular weight	98,08 g/ mol
Vapour pressure	6 Pa
Is the substance a solid?	No: liquid
Dustiness during process	n.a.
Duration of activity	From 15 mins to 1 hour
Use of ventilation	Indoors without LEV
The ECETOC exposure estimation is considered to be unsatisfactory and is not considered relevant for risk characterisation purposes.	

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ART model to conduct a Tier 2 assessment of inhalation exposure concentrations.

ART Model input parameters:

	PROC	Parameters/assumptions
Exposure duration	15	240 mins exposure / day; 240 mins non-exposure/day
Product type	15	Liquid (medium viscosity – like oil)
Process temperature	15	Room temperature (15-25°C)
Vapour pressure	15	Substance is considered to be low volatile, exposure to mists is estimated
Liquid weight fraction	15	0,98
Primary emission source proximity	15	Primary emission source located in the breathing zone of the workers (i.e. Within 1 metre)
Activity class	15	Transfer of liquids
Localized controls	15	LEV
Fugitive emission sources	15	Not fully enclosed – effective housekeeping practices in place.
Dispersion	15	Indoors, any sized room, only good natural ventilation

The estimated short and long-term concentrations are lower than relevant DNEL for all process categories.

3.2 Environment

Tier 1 assessment has been carried out applying EUSES model with standard input data and ERC.

Tier 1 assessment resulted a not realistic exposition.

Tier 2 assessment has been carried out applying EUSES model; refined inputs are chosen to best suit the description of the production and uses of sulfuric acid.

EUSES model input parameters

Input parameter	Value	Unit	ERC default (if applicable)
Molecular weight	98,08	g/mol	
Vapour pressure at 20°C	0,1	hPa	
Water solubility	miscible	Mg/ml	
Octanol/water partition coefficient	-1	LogKow	
Koc	1		
Biodegradability	Not biodegradable		
Life Cycle Step	Wide dispersive use		
Environmental Release Class	ERC 8a and 8b		
Fraction of Tonnage for Region (1 Tier)			1
STP			Yes
Emission events per year	330	days	20
Default Release to Air	ERC8A: 100 ERC8B: 0,1	%	ERC8A: 100 ERC8B: 0,1
Default Release to water	ERC8A: 100 ERC8B: 2	%	ERC8A: 100 ERC8B: 2
Dilution factor applied for PEC derivation			10 (20.000 m3/d)

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Tonnage assessed	5.000	tonnes/ year	
<p>RMMs and measured values for tier 2 assessment. Not applicable (tier 2 assessment not necessary).</p> <p>All estimated concentrations are lower than relevant DNEL.</p>			
Section 4 Guidance to check compliance with exposure scenario			
4.1 Health			
<p>Estimated workplace exposures are not expected to exceed DNELs when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 3. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.</p>			
4.2 Environment			
<p>Estimated exposures are not expected to exceed PNEC when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 2. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.</p>			

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13. Use of sulfuric acid in industrial cleaning

Section 1: Title of exposure scenario	
Short title of the exposure scenario: Use of sulfuric acid in industrial cleaning	
Title systematically based on the use of descriptors	
Sector of Use: (SU)	3
Product Category: (PC)	35
Process Categories: (PROC)	2, 5, 8a, 8b, 9, 10, 13
Environmental Release Category: (ERC)	8a, 8b
Covered processes and activities	
It is covered the use of sulfuric 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.	
Evaluation methodology	
Refer to section 3	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product Characteristics	
Physical state	Liquid
Vapour pressure (Pa)	214 (for dilute cleaning solution (based on data for the most dilute mixture available))
Molecular weight	98,08
Concentration of substance in product	10% (Approximate concentration in cleaning products)
Operational conditions	
Use amount per worker [workplace] per day	Sulfuric 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.
Frequency at workplace	220 d/year
Duration per day at workplace [for one worker]	8hr/d
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.
Respiration volume under conditions of use	10 m3/d (default value for a worker breathing for a 8hrs work day)
Skin contact area with the substance under conditions of use	480 cm2 (ECETOC default). Please note that due to the corrosive nature of sulfuric acid dermal exposure is not considered relevant for risk characterization as it must be prevented in all cases.
Room size and ventilation rate	n.a. Amounts used would vary by requirements and by facility but would generally be many times less than those involved with industrial processes.
Specific Risk management measures	
Containment plus good work practice required Local exhaust ventilation if required	Loading and unloading of vessels of sulfuric acid for use in maintenance of batteries 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.
Personal protective equipment (PPE)	Loading and unloading of vessels of sulfuric acid for use in maintenance of batteries 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.
Section 2.2 Control of environmental exposure	

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Product characteristics	
Molecular weight	98,08
Vapour pressure at 20°C (hPa)	0,1
Water solubility	Miscible
Octanol/water partition coefficient	-1 (logKow)
Koc	1
Biodegradability	Not biodegradable (inorganic acids cannot be considered biodegradable)
Amount of use	
Annual amount used per site	5.000 t/y (worst case site)
Frequency and duration of use	
continuous production	
Emission days	365 d/y (wide dispersive use)
Other operational conditions affecting environmental exposure	
Discharge volume of sewage treatment plant	2000 m3/d (EUSES default value for standard local STP)
Available river water volume to receive the emissions from a site	20.000 m3/d (Standard ERC flow rate leading to a 10 fold dilution in receiving waters.)
Risk management measures related to environmental emissions from industrial sites	
For this wide dispersive use particular risk management measures are not needed to demonstrate environmental safe use.	
Fractions of substance in waste and waste management measures	
Amount of substances in waste water resulting from identified uses covered in the exposure scenario	1.370 kg/d (based on worst case emission to waste waters identified)
Amount of substances in waste resulting from service life of articles	n.a.
Type of waste, suitable waste codes	Suitable EWC code(s)
Type of external treatment aiming at recycling or recovery of substances	None
Type of external treatment aiming at final disposal of the waste	Incineration or landfill.
Fraction of substance released into the environment via air from waste handling	n.a.
Fraction of substance released into the environment via waste water from waste handling	n.a.
Fraction of substance disposed of as secondary waste	n.a.
Section 3 Exposure estimation	
3.1 Health	
ECETOC TRA model to conduct a Tier 1 assessment of inhalation exposure concentrations. ECETOC TRA Model input parameters:	
	Parameter
Molecular weight	98,08 g/ mol
Vapour pressure	214 Pa
Is the substance a solid?	No: liquid
Dustiness during process	n.a.
Duration of activity	4 h (worst case)
Use of ventilation	Indoors with LEV
Substance in preparation	1-5%
The ECETOC exposure estimation is considered to be unsatisfactory and is not considered relevant for risk	

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characterisation purposes.

ART model to conduct a Tier 2 assessment of inhalation exposure concentrations.

ART Model input parameters:

	PROC	Parameters/assumptions
Exposure duration	All	480 mins
Product type	All	Liquid (low viscosity – like water)
Process temperature	All	Room temperature (15-25°C)
Vapour pressure	All	Substance is considered to be low volatile, exposure to mists is estimated
Liquid weight fraction	All	0,1
Primary emission source proximity	All	Primary emission source located in the breathing zone of the workers (i.e. Within 1 metre)
Activity class	2, 8a, 8b, 9	Transfer of liquids
	5, 13	Activities with open liquid surface or reservoirs
	10	Spreading of liquid products
Containment	2, 8a, 9	Handling reduces contact between product and adjacent air
	5, 8b, 10, 13	n.a.
Localized controls	2, 5	LEV
	8a, 8b, 9, 10, 13	None
Fugitive emission sources	All	Not fully enclosed – effective housekeeping practices in place.
Dispersion	All	Indoors, any sized room, only good natural ventilation

The estimated short and long-term concentrations are lower than relevant DNEL for all process categories, except:

- PROC 10: need of breathing system protection with at least 95% of efficiency, both for short and long term exposure,
- PROC 5: need of breathing system protection with at least 95% of efficiency for long term exposure.

3.2 Environment

Tier 1 assessment has been carried out applying EUSES model with standard input data and ERC.

Tier 1 assessment resulted a not realistic exposition.

Tier 2 assessment has been carried out applying EUSES model; refined inputs are chosen to best suit the description of the production and uses of sulfuric acid.

EUSES model input parameters

Input parameter	Value	Unit	ERC default (if applicable)
Molecular weight	98,08	g/mol	
Vapour pressure at 20°C	0,1	hPa	
Water solubility	miscible	Mg/ml	
Octanol/water partition coefficient	-1	LogKow	
Koc	1		
Biodegradability	Not biodegradable		
Life Cycle Step	Wide dispersive use		

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Environmental Release Class	ERC 8a and 8b		
Fraction of Tonnage for Region (1 Tier)			1
STP			Yes
Emission events per year	330	days	20
Default Release to Air	ERC8A: 100 ERC8B: 0,1	%	ERC8A: 100 ERC8B: 0,1
Default Release to water	ERC8A: 100 ERC8B: 2	%	ERC8A: 100 ERC8B: 2
Dilution factor applied for PEC derivation			10 (20.000 m3/d)
Tonnage assessed	5.000	tonnes/ year	

RMMs and measured values for tier 2 assessment.
Not applicable (tier 2 assessment not necessary).

All estimated concentrations are lower than relevant DNEL.

Section 4 Guidance to check compliance with exposure scenario

4.1 Health

Estimated workplace exposures are not expected to exceed DNELs when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 3.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

4.2 Environment

Estimated exposures are not expected to exceed PNEC when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 2.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

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14. Mixing, preparation and repackaging of sulfuric acid

Section 1: Title of exposure scenario	
Short title of the exposure scenario: Mixing, preparation and repackaging of sulfuric acid	
Title systematically based on the use of descriptors	
Sector of Use: (SU)	3, 10
Product Category: (PC)	n/a
Process Categories: (PROC)	1, 3, 5, 8a, 8b, 9
Environmental Release Category: (ERC)	2
Covered processes and activities	
It encompasses the use sulfuric acid during mixing, repackaging, preparation and in the production of Oleum. Oleum is produced using sulfur trioxide which is dissolved in concentrated sulfuric acid.	
Evaluation methodology	
Refer to section 3	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product Characteristics	
Physical state	Liquid
Vapour pressure (Pa)	6
Molecular weight	98,08
Concentration of substance in product	98%
Operational conditions	
Use amount per worker [workplace] per day	Worker exposure considered to be negligible due to specialised systems.
Frequency at workplace	220 d/year
Duration per day at workplace [for one worker]	8hr/d
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.
Respiration volume under conditions of use	10 m3/d (default value for a worker breathing for a 8hrs work day)
Skin contact area with the substance under conditions of use	480 cm2 (ECETOC default). Please note that due to the corrosive nature of sulfuric acid dermal exposure is not considered relevant for risk characterization as it must be prevented in all cases.
Room size and ventilation rate	n.a. (not relevant as workers work in a control room, with no direct contact to the installations housing the material)
Specific Risk management measures	
Containment plus good work practice required Local exhaust ventilation if required	Production and handling of sulfuric acid involves special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in the production and uses of sulfuric acid are usually housed outdoors.
Personal protective equipment (PPE)	Production and handling of sulfuric acid involves special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in the production and uses of sulfuric acid are usually housed outdoors. 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	A safety shower is required nearby loading and unloading areas in case of

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related to workers	accidental spillage.
Section 2.2 Control of environmental exposure	
Product characteristics	
Molecular weight	98,08
Vapour pressure at 20°C (hPa)	0,1
Water solubility	Miscible
Octanol/water partition coefficient	-1 (logKow)
Koc	1
Biodegradability	Not biodegradable (inorganic acids cannot be considered biodegradable)
Amount of use	
Annual amount used per site	300.000 t/y
Annual amount used per regione	3.000.000 t/y
Frequency and duration of use	
continuous production	
Emission days	365 d/y
Other operational conditions affecting environmental exposure	
Discharge volume of sewage treatment plant	2000 m3/d (EUSES default value for standard local STP)
Available river water volume to receive the emissions from a site	20.000 m3/d (Standard ERC flow rate leading to a 10 fold dilution in receiving waters.)
Risk management measures related to environmental emissions from industrial sites	
Onsite pre-treatment of waste water	Waste waters are generally treated on site by chemical neutralisation methods before release to the municipal STP or to the environment.
Resulting fraction of initially applied amount in waste water released from site to the external sewage system	The neutralisation process is extremely efficient and pH monitors are in place to ensure that complete neutralisation and removal have taken place.
Air emission abatement	Treated by scrubbers.
Resulting fraction of applied amount in waste gas released to environment	99% of waste gas removed by scrubber
Onsite waste treatment	The waste water neutralisation process is extremely efficient with almost total neutralisation achieved. pH alarms are in place to ensure that successful neutralisation has taken place.
Effluent (of the waste water treatment plant) discharge rate	2000 m3/ d (default value)
Recovery of sludge for agriculture or horticulture	No All sludge is collected and incinerated or sent to landfill.
Fractions of substance in waste and waste management measures	
Amount of substances in waste water resulting from identified uses covered in the exposure scenario	0 kg/d (value based on the specialised waste water treatment procedures)
Amount of substances in waste resulting from service life of articles	n.a.
Type of waste, suitable waste codes	Suitable EWC code(s)
Type of external treatment aiming at recycling or recovery of substances	None
Type of external treatment aiming at final disposal of the waste	Incineration or landfill.
Fraction of substance released into the environment via air from waste handling	n.a.

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Fraction of substance released into the environment via waste water from waste handling	n.a.	
Fraction of substance disposed of as secondary waste	n.a.	
Section 3 Exposure estimation		
3.1 Health		
ECETOC TRA model to conduct a Tier 1 assessment of inhalation exposure concentrations. ECETOC TRA Model input parameters:		
	Parameter	
Molecular weight	98,08 g/ mol	
Vapour pressure	6 Pa	
Is the substance a solid?	No: liquid	
Dustiness during process	n.a.	
Duration of activity	> 4 h	
Use of ventilation	Indoors without LEV	
The ECETOC exposure estimation is considered to be unsatisfactory and is not considered relevant for risk characterisation purposes.		
ART model to conduct a Tier 2 assessment of inhalation exposure concentrations. ART Model input parameters:		
	PROC	Parameters/assumptions
Exposure duration	All	480 mins
Product type	All	Liquid (medium viscosity – like oil)
Process temperature	1, 3	Hot processes (50-150°C)
	5, 8a, 8b, 9	Room temperature (15-25°C)
Vapour pressure	All	6 Pa (Substance is considered to be low volatile, exposure to mists is estimated)
Liquid weight fraction	All	0,98
Primary emission source proximity	1	Primary emission source is not located in the breathing zone of the worker (workers are in a control room)
	3, 5, 8a, 8b, 9	Primary emission source located in the breathing zone of the workers (i.e. Within 1 metre)
Activity class	1, 3, 5, 8a, 8b, 9	Trasferimento di prodotti liquidi
Containment	1, 3, 9	Handling reduces contact between product and adjacent air
	5, 8a, 8b	n.a.
Localized controls	1, 3, 8b	Vapour recovery system, LEV
	2, 9	Vapour recovery
	8a	None
	5	LEV
Segregation	1	Complete segregation of workers in separate control room
Fugitive emission sources	1, 3, 8b, 9	Process fully enclosed – not breached for sampling
	5, 8a	Not fully enclosed – effective housekeeping practices in place.

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Dispersion	1, 8a, 8b	Outdoors not close to buildings
	3	Outdoors near to buildings
	5, 9	Indoors, any sized room, only good natural ventilation

The estimated short and long-term concentrations are lower than relevant DNEL for all process categories.

3.2 Environment

Tier 1 assessment has been carried out applying EUSES model with standard input data and ERC.

Tier 1 assessment resulted a not realistic exposition.

Tier 2 assessment has been carried out applying EUSES model; refined inputs are chosen to best suit the description of the production and uses of sulfuric acid.

EUSES model input parameters

Input parameter	Value	Unit	ERC default (if applicable)
Molecular weight	98,08	g/mol	
Vapour pressure at 20°C	0,1	hPa	
Water solubility	miscible	Mg/ml	
Octanol/water partition coefficient	-1	LogKow	
Koc	1		
Biodegradability	Not biodegradable		
Life Cycle Step	Industrial use		
Environmental Release Class	ERC 2		
Fraction of Tonnage for Region (1 Tier)			1
STP			Yes
Emission events per year	330	days	20
Default Release to Air	2,5	%	2,5
Default Release to water	2	%	2
Dilution factor applied for PEC derivation			10 (20.000 m3/d)
Regional Tonnage	3.000.000	tonnes/ year	
Tonnage assessed	300.000		Worst case site formulation value

RMMs and measured values for tier 2 assessment.

Description of RMM	Details	Effect taken into account in EUSES	Comments
No loss to waste water	0 mg/l	Lowering of concentration in STP effluent to 0 mg/L due to the very efficient neutralization process	Total neutralization to around pH 7.
Emission days	365 emission days per year	Increase emission days by 20%.	Continuous production
Sludge removal	Sludge removed and sent to landfill or incinerated.	Concentration in soil due to sludge spreading set to 0.	No contamination of grassland or agricultural soil.
Gas	Waste gas scrubbing	Reduction of emission to	Based on scrubbing and gas removal. The

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scrubbing	removes 99% of the emitted sulfur oxides	atmosphere	values used in still considerably higher than the highest measured emission and should be considered conservative.
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All estimated concentrations are lower than relevant DNEL.

Section 4 Guidance to check compliance with exposure scenario

4.1 Health

Estimated workplace exposures are not expected to exceed DNELs when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 3.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

4.2 Environment

Estimated exposures are not expected to exceed PNEC when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 2.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

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15. Use of sulphuric acid as a drain cleaner

Section 1: Title of exposure scenario	
Short title of the exposure scenario: Use of sulphuric acid as a drain cleaner	
Title systematically based on the use of descriptors	
Sector of Use: (SU)	22
Product Category: (PC)	35
Process Categories: (PROC)	8a
Environmental Release Category: (ERC)	8a
Covered processes and activities	
Use of sulfuric acid as an agent for clogged drain cleaning deriving from chemically removable obstructions. It is assumed that the use of the indicated quantity of product is carried out through pouring it by a vessel (bottle) without applying pressure or orifices that allow the aerosols formation. To be conservative using the product in an enclosed space without air spare it is considered the worst case.	
Evaluation methodology	
Refer to section 3	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product Characteristics	
Physical state	Liquid
Vapour pressure (Pa)	6
Molecular weight	98,08
Concentration of substance in product	Covers percentage substance in the product up to 98% (before addition to the drain)
Operational conditions	
Use amount per worker [workplace] per day	No data (not applicable as this task is carried out sporadically by the consumer)
Frequency at workplace	220 days / year (In conservative way is considered the N° standard annual working days)
Duration per day at workplace [for one worker]	8hr/d (In conservative way is considered the N° standard working hours per day)
Other determinants related to duration, frequency and amount of use	There may be sporadic contact - The cleaning of drains using sulfuric acid is rarely done.
Respiration volume under conditions of use	10 m ³ /d (default value for a worker breathing for a 8hrs work day)
Skin contact area with the substance under conditions of use	Please note that due to the corrosive nature of sulphuric acid dermal exposure is not considered relevant for risk characterization as it must be prevented in all cases.
Room size and ventilation rate	Pouring of vessels of sulphuric acid for use as a drain cleaner usually performed indoors.
Specific Risk management measures	
Containment plus good work practice required Local exhaust ventilation if required	Pouring of bottles of sulphuric acid for use as a drain cleaner is usually indoors and no specific LEV is required.
Personal protective equipment (PPE)	Only basic dermal protection is required. It is recommended to wear adequate clothing, eye protection and gloves in order to prevent any exposure during the product handling.
Other risk management measures related to workers	None
Section 2.2 Control of environmental exposure	

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Product characteristics	
Molecular weight	98,08
Vapour pressure at 20°C (hPa)	0,1
Water solubility	Miscible
Octanol/water partition coefficient	-1 (logKow)
Koc	1
Biodegradability	Not biodegradable (inorganic acids cannot be considered biodegradable)
Amount of use	
Annual amount used per site	1 kg per use
Frequency and duration of use	
continuous production	
Emission days	365 d/y It is likely that these applications are carried out infrequently and so the effect of a single treatment of 1 kg per day over 365 days per year to a single STP is assessed.
Other operational conditions affecting environmental exposure	
Discharge volume of sewage treatment plant	2000 m3/d (EUSES default value for standard local STP)
Available river water volume to receive the emissions from a site	20.000 m3/d (Standard ERC flow rate leading to a 10 fold dilution in receiving waters.)
Risk management measures related to environmental emissions from industrial sites	
No specific RMMs are required beyond the intended application details and function of the product.	
Fractions of substance in waste and waste management measures	
Amount of substances in waste water resulting from identified uses covered in the exposure scenario	1 kg/d
Amount of substances in waste resulting from service life of articles	n.a.
Type of waste, suitable waste codes	Suitable EWC code(s)
Type of external treatment aiming at recycling or recovery of substances	None
Type of external treatment aiming at final disposal of the waste	None (emission to drains)
Fraction of substance released into the environment via air from waste handling	n.a.
Fraction of substance released into the environment via waste water from waste handling	n.a.
Fraction of substance disposed of as secondary waste	n.a.
Section 3 Exposure estimation	
3.1 Health	
The exposure assessment has been carried out by sampling based on possible drain cleaner sulfuric acid use scenarios. Therefore vapors dispersion was measured during use in different conditions and quantities through 7903 NIOSH method. The measure had effective results as recommended by drain cleaner producer.	
More conservative sampling parameters used	
	Parameter
Molecular weight	98,08 g/ mol
Vapour pressure	6 Pa (concentrated drain cleaner)
Is the substance a solid?	No: liquid
Dustiness during process	n.a.

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Duration of activity	Up to 25 minutes into the sink; up to 30 minutes in the toilet.
Environment	Local equipped with special utilities for use, the square footage of between 7.5 and 9 m3.
Use of ventilation	indoor places without local aspiration and without windows
Quantity	Up to 250 ml in the sink; up to 750 ml in water.

The measured inhalation exposures have undercut the chronic and acute DNEL. Therefore, no respiratory protection is required for this use.

3.2 Environment

Tier 1 assessment has been carried out applying EUSES model with standard input data and ERC.

Tier 1 assessment resulted a not realistic exposition.

Tier 2 assessment has been carried out applying EUSES model; refined inputs are chosen to best suit the description of the production and uses of sulphuric acid.

EUSES model input parameters

Input parameter	Value	Unit	ERC default (if applicable)
Molecular weight	98,08	g/mol	
Vapour pressure at 20°C	0,1	hPa	
Water solubility	miscible	Mg/ml	
Octanol/water partition coefficient	-1	LogKow	
Koc	1		
Biodegradability	Not biodegradable		
Life Cycle Step	Industrial use		
Environmental Release Class	ERC 8a		
Fraction of Tonnage for Region (1 Tier)			1
STP			Yes
Emission events per year	365	days	100
Default Release to Air	0	%	100
Default Release to water	100	%	100
Dilution factor applied for PEC derivation			10 (20.000 m3/d)
Tonnage assessed	EU: 1.800 Regional: 10%	t/y	For this indoor wide dispersive the local main source fraction is set to 0.2%

RMMs and measured values for tier 2 assessment.

No additional specific RMMs are required, apart from the details concerning the adequate use of the product.

All estimated concentrations are lower than relevant DNEL.

Section 4 Guidance to check compliance with exposure scenario

4.1 Health

Estimated workplace exposures are not expected to exceed DNELs when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 3.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks

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are managed to at least equivalent levels.

4.2 Environment

Estimated exposures are not expected to exceed PNEC when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 2.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

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16. Use of sulphuric acid as a drain cleaner (Consumers)

Section 1: Title of exposure scenario	
Short title of the exposure scenario: Use of sulphuric acid as a drain cleaner	
Title systematically based on the use of descriptors	
Sector of Use: (SU)	21
Product Category: (PC)	35
Process Categories: (PROC)	n.a.
Environmental Release Category: (ERC)	8a
Covered processes and activities	
Use of sulfuric acid as an agent for clogged drain cleaning deriving from chemically removable obstructions. It is assumed that the use of the indicated quantity of product is carried out through pouring it by a vessel (bottle) without applying pressure or orifices that allow the aerosols formation. To be conservative using the product in an enclosed space without air spare it is considered the worst case.	
Evaluation methodology	
Refer to section 3	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product Characteristics	
Physical state	Liquid
Vapour pressure (Pa)	6
Molecular weight	98,08
Concentration of substance in product	Covers percentage substance in the product up to 98% (before addition to the drain)
Operational conditions	
Use amount per worker [workplace] per day	not applicable - a this task is carried out sporadically by the consumer
Frequency at workplace	A few days a year (a this task is carried out sporadically by the consumer)
Duration per day at workplace [for one worker]	8hr/d (In conservative way is considered the N° standard working hours per day)
Other determinants related to duration, frequency and amount of use	Intermittent contact is expected - It is likely that these applications are carried out infrequently
Respiration volume under conditions of use	10 m ³ /d (default value for a worker breathing for a 8hrs work day)
Skin contact area with the substance under conditions of use	Please note that due to the corrosive nature of sulphuric acid dermal exposure is not considered relevant for risk characterization as it must be prevented in all cases.
Room size and ventilation rate	The activity is generally carried out in closed environments, in rooms of standard dimensions. Specific air intake system is not required.
Specific Risk management measures	
Local exhaust ventilation if not required	The activity is generally carried out in closed environments, in rooms of standard dimensions. Specific air intake system is not required.
Personal protective equipment (PPE)	Only basic dermal protection is required. It is recommended to wear adequate clothing, eye protection and gloves in order to prevent any exposure during the product handling.
Other risk management measures related to workers	None
Section 2.2 Control of environmental exposure	
Product characteristics	
Molecular weight	98,08
Vapour pressure at 20°C (hPa)	0,1

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Water solubility	Miscible														
Octanol/water partition coefficient	-1 (logKow)														
Koc	1														
Biodegradability	Not biodegradable (inorganic acids cannot be considered biodegradable)														
Amount of use															
Annual amount used per site	1 kg per use														
Frequency and duration of use															
continuous production															
Emission days	365 d/y It is likely that these applications are carried out infrequently and so the effect of a single treatment of 1 kg per day over 365 days per year to a single STP is assessed.														
Other operational conditions affecting environmental exposure															
Discharge volume of sewage treatment plant	2000 m3/d (EUSES default value for standard local STP)														
Available river water volume to receive the emissions from a site	20.000 m3/d (Standard ERC flow rate leading to a 10 fold dilution in receiving waters.)														
Risk management measures related to environmental emissions from industrial sites															
No specific RMMs are required beyond the intended application details and function of the product.															
Fractions of substance in waste and waste management measures															
Amount of substances in waste water resulting from identified uses covered in the exposure scenario	1 kg/d														
Amount of substances in waste resulting from service life of articles	n.a.														
Type of waste, suitable waste codes	Suitable EWC code(s)														
Type of external treatment aiming at recycling or recovery of substances	None														
Type of external treatment aiming at final disposal of the waste	None (emission to drains)														
Fraction of substance released into the environment via air from waste handling	n.a.														
Fraction of substance released into the environment via waste water from waste handling	n.a.														
Fraction of substance disposed of as secondary waste	n.a.														
Section 3 Exposure estimation															
3.1 Health															
<p>The exposure assessment has been carried out by sampling based on possible drain cleaner sulfuric acid use scenarios. Therefore vapors dispersion was measured during use in different conditions and quantities through 7903 NIOSH method. The measure had effective results as recommended by drain cleaner producer.</p> <p>More conservative sampling parameters used</p> <table border="1"> <tr> <td></td> <td>Parameter</td> </tr> <tr> <td>Molecular weight</td> <td>98,08 g/ mol</td> </tr> <tr> <td>Vapour pressure</td> <td>6 Pa (concentrated drain cleaner)</td> </tr> <tr> <td>Is the substance a solid?</td> <td>No: liquid</td> </tr> <tr> <td>Dustiness during process</td> <td>n.a.</td> </tr> <tr> <td>Duration of activity</td> <td>Up to 25 minutes into the sink; up to 30 minutes in the toilet.</td> </tr> <tr> <td>Environment</td> <td>Local equipped with special utilities for use, the square</td> </tr> </table>			Parameter	Molecular weight	98,08 g/ mol	Vapour pressure	6 Pa (concentrated drain cleaner)	Is the substance a solid?	No: liquid	Dustiness during process	n.a.	Duration of activity	Up to 25 minutes into the sink; up to 30 minutes in the toilet.	Environment	Local equipped with special utilities for use, the square
	Parameter														
Molecular weight	98,08 g/ mol														
Vapour pressure	6 Pa (concentrated drain cleaner)														
Is the substance a solid?	No: liquid														
Dustiness during process	n.a.														
Duration of activity	Up to 25 minutes into the sink; up to 30 minutes in the toilet.														
Environment	Local equipped with special utilities for use, the square														

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	footage of between 7.5 and 9 m3.
Use of ventilation	Indoor no local exhaust (LEV) and no windows.
Quantity	To 250 ml in the sink; up in 750 ml water.

The measured inhalation exposures have undercut the chronic and acute DNEL. Therefore, no respiratory protection is required for this use.

3.2 Environment

Tier 1 assessment has been carried out applying EUSES model with standard input data and ERC.

Tier 1 assessment resulted a not realistic exposition.

Tier 2 assessment has been carried out applying EUSES model; refined inputs are chosen to best suit the description of the production and uses of sulphuric acid.

EUSES model input parameters

Input parameter	Value	Unit	ERC default (if applicable)
Molecular weight	98,08	g/mol	
Vapour pressure at 20°C	0,1	hPa	
Water solubility	miscible	Mg/ml	
Octanol/water partition coefficient	-1	LogKow	
Koc	1		
Biodegradability	Not biodegradable		
Life Cycle Step	use distributed		
Environmental Release Class	ERC 8a		
Fraction of Tonnage for Region (1 Tier)			1
STP			Yes
Emission events per year	365	days	100
Default Release to Air	0	%	100
Default Release to water	100	%	100
Dilution factor applied for PEC derivation			10 (20.000 m3/d)
Tonnage assessed	EU: 1.800 Regional: 10%	t/y	For this indoor wide dispersive the local main source fraction is set to 0.2%

RMMs and measured values for tier 2 assessment.

No additional specific RMMs are required, apart from the details concerning the adequate use of the product.

All estimated concentrations are lower than relevant PNEC.

Section 4 Guidance to check compliance with exposure scenario

4.1 Health

Estimated workplace exposures are not expected to exceed DNELs when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 3.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

4.2 Environment

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Estimated exposures are not expected to exceed PNEC when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 2.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

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SULPHURIC TRIOXIDE
1. Production of sulfuric trioxide

Section 1: Title of exposure scenario	
Short title of the exposure scenario: Production of sulfuric acid	
Title systematically based on the use of descriptors	
Sector of Use: (SU)	3
Product Category: (PC)	Not applicable
Process Categories: (PROC)	1, 2, 8b, 9
Environmental Release Category: (ERC)	1
Covered processes and activities	
Sulphur trioxide is produced only on a large industrial scale under strictly controlled conditions. The commonly used method of manufacture of sulphur trioxide is from molten sulphur which is burnt in air to form SO ₂ gas which is then oxidised to SO ₃ in the present of a metal oxide catalyst. The produced sulphur trioxide gas can then passed through 97-98% H ₂ SO ₄ to form oleum which may be collected or stored to be sold, transferred or used on site or can be stored or transferred as pure sulphur trioxide. Due to the hazardous and corrosive nature of sulphur trioxide the production systems are highly controlled and employ closed systems during the production processes. The production includes recovery/recycle, loading/unloading, storage, maintenance and sampling	
Evaluation methodology	
Refer to section 3	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product Characteristics	
Physical state	Liquid
Vapour pressure (Pa)	9730
Molecular weight	98,08
Concentration of substance in product	>98%
Operational conditions	
Use amount per worker [workplace] per day	Worker exposure considered to be negligible due to the specialized systems and closed nature of the production process.
Frequency at workplace	220 d/year
Duration per day at workplace [for one worker]	8hr/d
Other determinants related to duration, frequency and amount of use	Intermittent contact is expected
Respiration volume under conditions of use	10 m ³ /d (default value for a worker breathing for a 8hrs work day)
Skin contact area with the substance under conditions of use	480 cm ² (ECETOC default). Please note that due to the corrosive nature of sulfuric trioxide dermal exposure is not considered relevant for risk characterization as it must be prevented in all cases.
Room size and ventilation rate	Not applicable. (not relevant as workers work in a control room, with no direct contact to the installations housing the material)
Specific Risk management measures	

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Containment plus good work practice required	<p>Production and handling of sulfuric trioxide involves special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in the production and uses of sulfuric trioxide are usually housed outdoors.</p> <p>The process is completely closed cycle with continuous monitoring. The plants are located outside and the emission sources are generally located at a distance greater than 4 meters by workers</p> <p>Waste gas from containers are collected and send by pipeline to a treatment facility (scrubber or filtration)</p>
Local exhaust ventilation: required	Are generally present local exhaust ventilation systems (LEV) and vapor recovery system
Personal protective equipment (PPE)	Workers involved in sampling and transfer of materials to road tankers are trained in the procedures and protective equipment (gloves, respirator, face shield etc) is intended to cope with the worst case scenario, in order to minimize exposure and risks.
Other risk management measures related to workers	The workers must generally operate from the control room .. We recommend uploading submerged to reduce the formation of aerosols A safety shower is required nearby loading and unloading areas in case of accidental spillage.
Section 2.2 Control of environmental exposure	
Product characteristics	
Molecular weight	80,06
Vapour pressure at 20°C (hPa)	9730
Water solubility	1000 mg/l
Octanol/water partition coefficient	-1 (logKow)
Koc	1
Biodegradability	Not biodegradable (inorganic acids cannot be considered biodegradable)
Amount of use	
Annual tonnage of the site	60.000 t/y
Annual amount used per region	350.000 t/y
Frequency and duration of use	
continuous production	
Emission days	360 d/y
Other operational conditions affecting environmental exposure	
Discharge volume of sewage treatment plant	2000 m3/d (EUSES default value for standard local STP)
Available river water volume to receive the emissions from a site	20.000 m3/d (Standard ERC flow rate leading to a 10 fold dilution in receiving waters.)
Risk management measures related to environmental emissions from industrial sites	
Onsite pre-treatment of waste water	Waste waters are generally treated by on site WWTP which will be neutralised before it reaches the biological tower of the WWTP or will be treated on site by chemical neutralisation methods before release to the municipal STP or to the environment.
Resulting fraction of initially applied amount in waste water released from site to the external sewage system	The neutralisation process is extremely efficient and pH monitors are in place to ensure that complete neutralisation and removal have taken place.

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Air emission abatement	Effectiveness: Adequate measures in place Exhaust gases may be treated by scrubbers or emissions may be measured and controlled according to local legislation.																
Onsite waste treatment	The waste water neutralisation process is extremely efficient with almost total neutralisation achieved. pH alarms are in place to ensure that successful neutralisation has taken place.																
Effluent (of the waste water treatment plant) discharge rate	2000 m3/ d (default value)																
Recovery of sludge for agriculture or horticulture	No All sludge is collected and incinerated or sent to landfill.																
Fractions of substance in waste and waste management measures																	
Amount of substances in waste water resulting from identified uses covered in the exposure scenario	0 kg/d (value based on the specialised waste water treatment procedures)																
Amount of substances in waste resulting from service life of articles	Not applicable																
Type of waste, suitable waste codes	Suitable EWC code(s)																
Type of external treatment aiming at recycling or recovery of substances	None																
Type of external treatment aiming at final disposal of the waste	Incineration or landfill.																
Fraction of substance released into the environment via air from waste handling	Not applicable																
Fraction of substance released into the environment via waste water from waste handling	Not applicable																
Fraction of substance disposed of as secondary waste	Not applicable																
Section 3 Exposure estimation																	
3.1 Health																	
ECETOC TRA model to conduct a Tier 1 assessment of inhalation exposure concentrations ECETOC TRA Model input parameters:																	
<table border="1"> <thead> <tr> <th></th> <th>Parameter</th> </tr> </thead> <tbody> <tr> <td>Molecular weight</td> <td>80,06 g/ mol</td> </tr> <tr> <td>Vapour pressure</td> <td>9730 Pa</td> </tr> <tr> <td>Is the substance a solid?</td> <td>No: liquid</td> </tr> <tr> <td>Dustiness during process</td> <td>Not applicable</td> </tr> <tr> <td>Duration of activity</td> <td>> 4 h</td> </tr> <tr> <td>Use of ventilation</td> <td>Indoors with LEV</td> </tr> <tr> <td>Respiratory protection</td> <td>Yes with an efficiency of at least 95%</td> </tr> </tbody> </table>			Parameter	Molecular weight	80,06 g/ mol	Vapour pressure	9730 Pa	Is the substance a solid?	No: liquid	Dustiness during process	Not applicable	Duration of activity	> 4 h	Use of ventilation	Indoors with LEV	Respiratory protection	Yes with an efficiency of at least 95%
	Parameter																
Molecular weight	80,06 g/ mol																
Vapour pressure	9730 Pa																
Is the substance a solid?	No: liquid																
Dustiness during process	Not applicable																
Duration of activity	> 4 h																
Use of ventilation	Indoors with LEV																
Respiratory protection	Yes with an efficiency of at least 95%																
The ECETOC exposure estimation is considered to be unsatisfactory and is not considered relevant for risk characterisation purposes.																	
ART model to conduct a Tier 2 assessment of inhalation exposure concentrations ART Model input parameters:																	
<table border="1"> <thead> <tr> <th></th> <th>PROC</th> <th>Parameters/assumptions</th> </tr> </thead> <tbody> <tr> <td>Exposure duration</td> <td>All</td> <td>480 minutes</td> </tr> </tbody> </table>			PROC	Parameters/assumptions	Exposure duration	All	480 minutes										
	PROC	Parameters/assumptions															
Exposure duration	All	480 minutes															

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Product type	All	Liquid (medium viscosity – like oil)
Process temperature	1, 2	Hot processes (50-150°C)
	8b, 9	Room temperature (15-25°C)
Vapur pressure	All	9730 Pa
Liquid weight fraction	All	100%
Primary emission source proximity	All	Primary emission source is not located in the breathing zone of the worker - the assessment for this activity involves a primary far-field emission source only (workers are in a control room)
Activity class	All	Transfer of liquid products
Containment	1, 2, 9	Handling reduces contact between product and adjacent air, load under controlled condition
Localized controls	1, 8b, 9	Local exhaust ventilation systems (LEV) and vapor recovery system
	2	Vapour recovery
Segregation	1, 2, 9	Complete segregation of workers in separate control room
	8b	Partial segregation of workers
Fugitive emission sources	1, 8b, 9	Process fully enclosed – not breached for sampling
	2	Vapor recovery system
Dispersion	1, 2	Outdoors not close to buildings, workers located at a distance from the source greater than 4 meters
	8b	Outdoors near to buildings, workers located at a distance from the source greater than 4 meters
	9	Indoors, any sized room, only good natural ventilation

The estimated short and long-term concentrations are lower than relevant DNEL for all process categories.

3.2 Environment

Tier 1 assessment has been carried out applying EUSES model with standard input data and ERC.

Tier 1 assessment resulted a not realistic exposition.

Tier 2 assessment has been carried out applying EUSES model; refined inputs are chosen to best suit the description of the production and uses of sulfuric trioxide

EUSES model input parameters

Input parameter	Value	Unit	ERC default (if applicable)
Molecular weight	80.06	g/mol	
Vapour pressure at 20°C	9730	Pa	
Water solubility	1000	mg/l	
Octanol/water partition coefficient	-1	LogKow	
Koc	1		
Biodegradability	Not biodegradable		
Life Cycle Step	Production		

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Environmental Release Class	ERC1		
Fraction of Tonnage for Region (1 Tier)			1
STP			Yes
Emission events per year	360	days	300
Default Release to Air	5	%	5
Default Release to water	6	%	6
Dilution factor applied for PEC derivation			10 (20.000 m3/d)
Tonnage assessed	Local: 60.000 Regional: 350.000	tonnes/ year	

RMMs and measured values for tier 2 assessment.

Description of RMM	Details	Effect taken into account in EUSES	Comments
No loss to waste water	0 mg/l	Lowering of concentration in STP effluent to 0 mg/L due to conversion of trioxide to sulphuric acid, and the very efficient neutralization process	Total neutralization to around pH 7.
Emission days	360 emission days per year	Increase emission days by 20%.	Continuous production
Sludge removal	Sludge removed to landfill or incinerated.	Concentration in soil due to sludge spreading set to 0.	No contamination of grassland or agricultural soil.

All estimated concentrations are lower than relevant PNEC

Section 4 Guidance to check compliance with exposure scenario

4.1 Health

Estimated workplace exposures are not expected to exceed DNELs when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 3.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

4.2 Environment

Estimated exposures are not expected to exceed PNEC when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 3
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

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2. Use of sulfuric trioxide as an Intermediate

Section 1: Title of exposure scenario	
Short title of the exposure scenario: Production of sulfuric acid	
Title systematically based on the use of descriptors	
Sector of Use: (SU)	3, 8, 9
Product Category: (PC)	19
Process Categories: (PROC)	1, 2, 3, 4, 8b, 9
Environmental Release Category: (ERC)	6a
Covered processes and activities	
<p>As an intermediate sulphur trioxide is primarily used in the synthesis of other chemicals including organic compounds (as a sulphonation agent) but most commonly in the production of sulphuric acid on a large industrial scale by reacting with water to form the acid.</p> <p>Due to the hazardous and corrosive nature of sulphur trioxide when used as an intermediate, the process is conducted under highly controlled conditions. Includes the following accidental exposure during activities: recovery/recycle, loading/unloading, storage, maintenance and sampling</p>	
Evaluation methodology	
Refer to section 3	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product Characteristics	
Physical state	Liquid
Vapour pressure (Pa)	9730
Molecular weight	98,08
Concentration of substance in product	>98%
Operational conditions	
Use amount per worker [workplace] per day	Worker exposure considered to be negligible due to the specialized systems and closed nature of the production process.
Frequency at workplace	220 d/year
Duration per day at workplace [for one worker]	8hr/d
Other determinants related to duration, frequency and amount of use	Intermittent contact is expected
Respiration volume under conditions of use	10 m3/d (default value for a worker breathing for a 8hrs work day)
Skin contact area with the substance under conditions of use	480 cm2 (ECETOC default). Please note that due to the corrosive nature of sulfuric trioxide dermal exposure is not considered relevant for risk characterization as it must be prevented in all cases.
Room size and ventilation rate	Not applicable. (not relevant as workers work in a control room, with no direct contact to the installations housing the material)
Specific Risk management measures	
Containment plus good work practice required	<p>Production and handling of sulfuric trioxide involves special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in the production and uses of sulfuric trioxide are usually housed outdoors.</p> <p>The process is completely closed cycle with continuous monitoring. The plants are located outside and the emission sources are generally located at</p>

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	a distance greater than 4 meters by workers Waste gas from containers are collected and send by pipeline to a treatment facility (scrubber or filtration)
Local exhaust ventilation: required	Are generally present local exhaust ventilation systems (LEV) and vapor recovery system
Personal protective equipment (PPE)	During the use of sulphur trioxide as an intermediate, controlled systems are in place to reduce the potential for worker exposure in all cases. Road/rail tanker connecting and disconnecting (loading and unloading) generally takes place in the open air. Loading and unloading of tankers with sulphur trioxide or with oleum containing sulphur trioxide is 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.
Other risk management measures related to workers	The workers must generally operate from the control room .. We recommend uploading submerged to reduce the formation of aerosols A safety shower is required nearby loading and unloading areas in case of accidental spillage.
Section 2.2 Control of environmental exposure	
Product characteristics	
Molecular weight	80,06
Vapour pressure at 20°C (hPa)	9730
Water solubility	1000 mg/l
Octanol/water partition coefficient	-1 (logKow)
Koc	1
Biodegradability	Not biodegradable (inorganic acids cannot be considered biodegradable)
Amount of use	
Annual tonnage of the site	10.000 t/y
Frequency and duration of use	
continuous production	
Emission days	360 d/y
Other operational conditions affecting environmental exposure	
Discharge volume of sewage treatment plant	2000 m3/d (EUSES default value for standard local STP)
Available river water volume to receive the emissions from a site	20.000 m3/d (Standard ERC flow rate leading to a 10 fold dilution in receiving waters.)
Risk management measures related to environmental emissions from industrial sites	
Onsite pre-treatment of waste water	Waste waters are generally treated by on site WWTP which will be neutralised before it reaches the biological tower of the WWTP or will be treated on site by chemical neutralisation methods before release to the municipal STP or to the environment.
Resulting fraction of initially applied amount in waste water released from site to the external sewage system	The neutralisation process is extremely efficient and pH monitors are in place to ensure that complete neutralisation and removal have taken place.

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Air emission abatement	Treated by scrubbers .	
Onsite waste treatment	The waste water neutralisation process is extremely efficient with almost total neutralisation achieved. pH alarms are in place to ensure that successful neutralisation has taken place.	
Effluent (of the waste water treatment plant) discharge rate	2000 m3/ d (default value)	
Recovery of sludge for agriculture or horticulture	No All sludge is collected and incinerated or sent to landfill.	
Fractions of substance in waste and waste management measures		
Amount of substances in waste water resulting from identified uses covered in the exposure scenario	0 kg/d (value based on the specialised waste water treatment procedures)	
Amount of substances in waste resulting from service life of articles	Not applicable	
Type of waste, suitable waste codes	Suitable EWC code(s)	
Type of external treatment aiming at recycling or recovery of substances	None	
Type of external treatment aiming at final disposal of the waste	Incineration or landfill.	
Fraction of substance released into the environment via air from waste handling	Not applicable	
Fraction of substance released into the environment via waste water from waste handling	Not applicable	
Fraction of substance disposed of as secondary waste	Not applicable	
Section 3 Exposure estimation		
3.1 Health		
ECETOC TRA model to conduct a Tier 1 assessment of inhalation exposure concentrations ECETOC TRA Model input parameters:		
	Parameter	
Molecular weight	80,06 g/ mol	
Vapour pressure	9730 Pa	
Is the substance a solid?	No: liquid	
Dustiness during process	Not applicable	
Duration of activity	> 4 h	
Use of ventilation	Indoors with LEV	
Respiratory protection	Yes with an efficiency of at least 95%	
The ECETOC exposure estimation is considered to be unsatisfactory and is not considered relevant for risk characterisation purposes.		
ART model to conduct a Tier 2 assessment of inhalation exposure concentrations ART Model input parameters:		
	PROC	Parameters/assumptions
Exposure duration	1, 2, 8b, 9	480 minutes

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	3,4	120 minutes
Product type	All	Liquid
Process temperature	1, 2, 3, 4	Hot processes (50-150°C)
	8b, 9	Room temperature (15-25°C)
Vapour pressure	All	9730 Pa
Liquid weight fraction	All	100%
Primary emission source proximity	All	Primary emission source is not located in the breathing zone of the worker - the assessment for this activity involves a primary far-field emission source only (workers are in a control room)
Activity class	All	Transfer of liquid products
Containment	1, 2, 3, 9	The handling of sulphur trioxide is such that contact between product and adjacent air is reduced and submerged loading is used reducing the amount of aerosol formation
	4	Open process, submerged loading
	8b	Not applicable
Localized controls	1,3, 8b, 9	Local exhaust ventilation systems (LEV) and vapor recovery system
	2, 4	Vapour recovery
Segregation	1, 2, 9	Complete segregation of workers in separate control room
	3,4, 8b	Partial segregation of workers
Fugitive emission sources	1, 8b, 9	Process fully enclosed – not breached for sampling
	2, 3, 4	Not fully enclosed – effective housekeeping practices in place.
Dispersion	1, 2	Outdoors not close to buildings, workers located at a distance from the source greater than 4 meters
	3, 4, 8b	Outdoors near to buildings, workers located at a distance from the source greater than 4 meters
	9	Indoors, any sized room, only good natural ventilation

The estimated short and long-term concentrations are lower than relevant DNEL for all process categories.

3.2 Environment

Tier 1 assessment has been carried out applying EUSES model with standard input data and ERC.

Tier 1 assessment resulted a not realistic exposition.

Tier 2 assessment has been carried out applying EUSES model; refined inputs are chosen to best suit the description of the production and uses of sulfuric trioxide

EUSES model input parameters

Input parameter	Value	Unit	ERC default (if applicable)
Molecular weight	80.06	g/mol	
Vapour pressure at 20°C	9730	Pa	
Water solubility	1000	mg/l	

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Octanol/water partition coefficient	-1	LogKow	
Koc	1		
Biodegradability	Not biodegradable		
Life Cycle Step	Industrial use resulting in manufacture of another substance (use of intermediates)		
Environmental Release Class	ERC6A		
Fraction of Tonnage for Region (1 Tier)			1
STP			Yes
Emission events per year	360	days	300
Default Release to Air	5	%	5
Default Release to water	2	%	2
Dilution factor applied for PEC derivation			10 (20.000 m ³ /d)
Tonnage assessed	Local: 10.000	tonnes/ year	Worst case for each site

RMMs and measured values for tier 2 assessment.

Description of RMM	Details	Effect taken into account in EUSES	Comments
No loss to waste water	0 mg/l	Lowering of concentration in STP effluent to 0 mg/L due to conversion of trioxide to sulphuric acid, and the very efficient neutralization process	Total neutralization to around pH 7.
Emission days	360 emission days per year	Increase emission days by 20%.	Continuous production
Sludge removal	Sludge removed to landfill or incinerated.	Concentration in soil due to sludge spreading set to 0.	No contamination of grassland or agricultural soil.

All estimated concentrations are lower than relevant PNEC

Section 4 Guidance to check compliance with exposure scenario

4.1 Health

Estimated workplace exposures are not expected to exceed DNELs when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 3.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

4.2 Environment

Estimated exposures are not expected to exceed PNEC when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 3
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

OLEUM

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3. Use of Sulphur Trioxide as a Nitration Agent

Section 1: Title of exposure scenario	
Short title of the exposure scenario: Production of sulfuric acid	
Title systematically based on the use of descriptors	
Sector of Use: (SU)	3, 8, 9
Product Category: (PC)	20,21
Process Categories: (PROC)	1, 2, 3, 4, 8b, 9, 15
Environmental Release Category: (ERC)	6b
Covered processes and activities	
<p>Sulphur trioxide is used as a nitrating agent in industrial laboratories during the manufacture of organic chemicals and inorganic chemicals. Sulphur trioxide is generally used at around 25% concentrations (or in formulated oleum) in combination with nitric acid to form a nitration agent which can then be reacted with organic chemicals. The primary function of the sulphur trioxide in the reaction is to react with moisture and remove it in order to dry up the mixture and so the added sulphur trioxide is rapidly converted to sulphuric acid.</p> <p>Due to the hazardous and corrosive nature of sulphur trioxide when used as a nitration agent, the process is conducted under highly controlled conditions. Includes the following accidental exposure during activities: recovery/recycle, loading/unloading, storage, maintenance and sampling</p>	
Evaluation methodology	
Refer to section 3	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product Characteristics	
Physical state	Liquid
Vapour pressure (Pa)	9730
Molecular weight	98,08
Concentration of substance in product	20-25%
Operational conditions	
Use amount per worker [workplace] per day	Worker exposure considered to be negligible due to the specialized systems and closed nature of the production process.
Frequency at workplace	220 d/year
Duration per day at workplace [for one worker]	8hr/d
Other determinants related to duration, frequency and amount of use	Intermittent contact is expected
Respiration volume under conditions of use	10 m ³ /d (default value for a worker breathing for a 8hrs work day)
Skin contact area with the substance under conditions of use	480 cm ² (ECETOC default). Please note that due to the corrosive nature of sulfuric trioxide dermal exposure is not considered relevant for risk characterization as it must be prevented in all cases.
Room size and ventilation rate	Most of the industrial laboratories is equipped with adequate ventilation and segregation controlled
Specific Risk management measures	

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Containment plus good work practice required	Production and handling of sulfuric trioxide involves special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in the production and uses of sulfuric trioxide are usually housed outdoors. Waste gas from containers are collected and send by pipeline to a treatment facility (scrubber or filtration)
Local exhaust ventilation: required	LEV and vapour recovery systems such as flow hoods and glove boxes are in place in the area where sulphur trioxide is used as a nitration agent. Systems handling sulphur trioxide should be properly contained and workers should be segregated from any possible emissions.
Personal protective equipment (PPE)	Workers wear protective clothing (face/eye protection, helmet, anti-acid gloves boots and protective overall). Workers involved in the transfer and sampling operations are trained in the procedures and protective equipment is intended to cope with the worst case scenario to minimize exposure.
Other risk management measures related to workers	The workers must generally operate from the control room .. We recommend uploading submerged to reduce the formation of aerosols A safety shower is required nearby loading and unloading areas in case of accidental spillage.

Section 2.2 Control of environmental exposure

Product characteristics

Molecular weight	80,06
Vapour pressure at 20°C (hPa)	9730
Water solubility	1000 mg/l
Octanol/water partition coefficient	-1 (logKow)
Koc	1
Biodegradability	Not biodegradable (inorganic acids cannot be considered biodegradable)

Amount of use

Annual tonnage of the site	5.000 t/y
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Frequency and duration of use

continuous production	
Emission days	330 d/y

Other operational conditions affecting environmental exposure

Discharge volume of sewage treatment plant	2000 m3/d (EUSES default value for standard local STP)
Available river water volume to receive the emissions from a site	20.000 m3/d (Standard ERC flow rate leading to a 10 fold dilution in receiving waters.)

Risk management measures related to environmental emissions from industrial sites

Onsite pre-treatment of waste water	Waste waters are generally treated by on site WWTP which will be neutralised before it reaches the biological tower of the WWTP or will be treated on site by chemical neutralisation methods before release to the municipal STP or to the environment.
Resulting fraction of initially applied amount in waste water released from site to the external sewage system	The neutralisation process is extremely efficient and pH monitors are in place to ensure that complete neutralisation and removal have taken place.
Air emission abatement	Treated by scrubbers .

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Onsite waste treatment	The waste water neutralisation process is extremely efficient with almost total neutralisation achieved. pH alarms are in place to ensure that successful neutralisation has taken place.
Effluent (of the waste water treatment plant) discharge rate	2000 m ³ / d (default value)
Recovery of sludge for agriculture or horticulture	No All sludge is collected and incinerated or sent to landfill.
Fractions of substance in waste and waste management measures	
Amount of substances in waste water resulting from identified uses covered in the exposure scenario	0 kg/d (value based on the specialised waste water treatment procedures)
Amount of substances in waste resulting from service life of articles	Not applicable
Type of waste, suitable waste codes	Suitable EWC code(s)
Type of external treatment aiming at recycling or recovery of substances	None
Type of external treatment aiming at final disposal of the waste	Incineration or landfill.
Fraction of substance released into the environment via air from waste handling	Not applicable
Fraction of substance released into the environment via waste water from waste handling	Not applicable
Fraction of substance disposed of as secondary waste	Not applicable

Section 3 Exposure estimation

3.1 Health

ECETOC TRA model to conduct a Tier 1 assessment of inhalation exposure concentrations

ECETOC TRA Model input parameters:

	Parameter
Molecular weight	80,06 g/ mol
Vapour pressure	9730 Pa
Is the substance a solid?	No: liquid
Dustiness during process	Not applicable
Duration of activity	> 4 h
Use of ventilation	Indoors with LEV
Respiratory protection	Yes with an efficiency of at least 95%a

The ECETOC exposure estimation is considered to be unsatisfactory and is not considered relevant for risk characterisation purposes.

ART model to conduct a Tier 2 assessment of inhalation exposure concentrations

ART Model input parameters:

	PROC	Parameters/assumptions
Exposure duration	1, 2, 8b, 9	480 minutes
	3,4, 15	120 minutes
Product type	All	Liquid
Process temperature	1, 2, 3, 4	Hot processes (50-150°C)
	8b, 9	Room temperature (15-25°C)
Vapour pressure	All	9730 Pa

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Liquid weight fraction	All	10-50%
Primary emission source proximity	1, 2, 3, 4, 8b, 9	Primary emission source is located in the breathing zone of the worker (i.e. Within a metre)- the assessment for this activity involves a primary far-field emission source only (workers are in a control room)
	15	Primary emission source is not located in the breathing zone of the worker - the assessment for this activity involves a primary far-field emission source only (workers are in a control room)
Activity class	All	Transfer of liquid products
Containment	1, 2, 3, 9	The handling of sulphur trioxide is such that contact between product and adjacent air is reduced and submerged loading is used reducing the amount of aerosol formation
	4	Open process, submerged loading
	8b	Not applicable
	15	Open process,
Localized controls	1,3, 8b, 9	Local exhaust ventilation systems (LEV) and vapor recovery system
	2, 4	Vapour recovery
	15	Local exhaust ventilation systems (LEV) and glove boxes
Segregation	1, 2, 9	Complete segregation of workers in separate control room
	3,4, 8b	Partial segregation of workers
	15	Not applicable
Fugitive emission sources	1, 8b, 9	Process fully enclosed – not breached for sampling
	2, 3, 4, 15	Not fully enclosed – effective housekeeping practices in place.
Dispersion	1, 2	Outdoors not close to buildings, workers located at a distance from the source greater than 4 meters
	3, 4, 8b	Outdoors near to buildings, workers located at a distance from the source greater than 4 meters
	9	Indoors, any sized room, only good natural ventilation

The estimated short and long-term concentrations are lower than relevant DNEL for all process categories.

3.2 Environment

Tier 1 assessment has been carried out applying EUSES model with standard input data and ERC.
Tier 1 assessment resulted a not realistic exposition.
Tier 2 assessment has been carried out applying EUSES model; refined inputs are chosen to best suit the description of the production and uses of sulfuric trioxide

EUSES model input parameters

Input parameter	Value	Unit	ERC default
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			(if applicable)
Molecular weight	80.06	g/mol	
Vapour pressure at 20°C	9730	Pa	
Water solubility	1000	mg/l	
Octanol/water partition coefficient	-1	LogKow	
Koc	1		
Biodegradability	Not biodegradable		
Life Cycle Step	Industrial use		
Environmental Release Class	ERC6B		
Fraction of Tonnage for Region (1 Tier)			1
STP			Yes
Emission events per year	360	days	300
Default Release to Air	0,10	%	0,10
Default Release to water	5	%	5
Dilution factor applied for PEC derivation			10 (20.000 m3/d)
Tonnage assessed	Local: 5.000	tonnes/ year	Worst case for each site

RMMs and measured values for tier 2 assessment.

Description of RMM	Details	Effect taken into account in EUSES	Comments
No loss to waste water	0 mg/l	Lowering of concentration in STP effluent to 0 mg/L due to conversion of trioxide to sulphuric acid, and the very efficient neutralization process	Total neutralization to around pH 7.
Emission days	360 emission days per year	Increase emission days by 20%.	Continuous production
Sludge removal	Sludge removed to landfill or incinerated.	Concentration in soil due to sludge spreading set to 0.	No contamination of grassland or agricultural soil.

All estimated concentrations are lower than relevant PNEC

Section 4 Guidance to check compliance with exposure scenario

4.1 Health

Estimated workplace exposures are not expected to exceed DNELs when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 3.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

4.2 Environment

Estimated exposures are not expected to exceed PNEC when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 3
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

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4. Formulation of oleum.

Section 1: Title of exposure scenario	
Short title of the exposure scenario: Production of sulfuric acid	
Title systematically based on the use of descriptors	
Sector of Use: (SU)	10
Product Category: (PC)	20,21
Process Categories: (PROC)	1, 8b, 9
Environmental Release Category: (ERC)	2
Covered processes and activities	
<p>Oleum is produced using sulphur trioxide which is dissolved in concentrated sulphuric acid. Sulphuric acid is used in this manner is generally recycled by dilution of the produced oleum.</p> <p>The sulphur trioxide within the oleum formulation is not chemically changed and can be removed by heating and distillation of the oleum.</p> <p>Due to the hazardous and corrosive nature of sulphur trioxide when used as a nitration agent, the process is conducted under highly controlled conditions. Includes the following accidental exposure during activities: recovery/recycle, loading/unloading, storage, maintenance and sampling</p>	
Evaluation methodology	
Refer to section 3	
Section 2 Operational conditions and risk management measures	
Section 2.1 Control of worker exposure	
Product Characteristics	
Physical state	Liquid
Vapour pressure (Pa)	9730
Molecular weight	98,08
Concentration of substance in product	Production SO ₃ > 98% in Oleum concentration from 20 -25 %
Operational conditions	
Use amount per worker [workplace] per day	Worker exposure considered to be negligible due to the specialized systems and closed nature of the production process.
Frequency at workplace	220 d/year
Duration per day at workplace [for one worker]	8hr/d
Other determinants related to duration, frequency and amount of use	Intermittent contact is expected
Respiration volume under conditions of use	10 m ³ /d (default value for a worker breathing for a 8hrs work day)
Skin contact area with the substance under conditions of use	480 cm ² (ECETOC default). Please note that due to the corrosive nature of sulfuric trioxide dermal exposure is not considered relevant for risk characterization as it must be prevented in all cases.
Room size and ventilation rate	Not applicable. (not relevant as workers work in a control room, with no direct contact to the installations housing the material)
Specific Risk management measures	

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Containment plus good work practice required	Production and handling of sulfuric trioxide involves special equipment and high integrity contained systems with little or no potential for exposure. Facilities involved in the production and uses of sulfuric trioxide are usually housed outdoors. The process is completely closed cycle with continuous monitoring. The plants are located outside and the emission sources are generally located at a distance greater than 4 meters by workers Waste gas from containers are collected and send by pipeline to a treatment facility (scrubber or filtration)
Local exhaust ventilation: required	Are generally present local exhaust ventilation systems (LEV) and vapor recovery system
Personal protective equipment (PPE)	Workers wear protective clothing (face/eye protection, helmet, anti-acid gloves boots and protective overall). Workers involved in the transfer to/from road tankers and sampling operations are trained in the procedures and protective equipment is intended to cope with the worst case scenario to minimize exposure.
Other risk management measures related to workers	The workers must generally operate from the control room .. We recommend uploading submerged to reduce the formation of aerosols A safety shower is required nearby loading and unloading areas in case of accidental spillage.
Section 2.2 Control of environmental exposure	
Product characteristics	
Molecular weight	80,06
Vapour pressure at 20°C (hPa)	9730
Water solubility	1000 mg/l
Octanol/water partition coefficient	-1 (logKow)
Koc	1
Biodegradability	Not biodegradable (inorganic acids cannot be considered biodegradable)
Amount of use	
Annual tonnage of the site	75.000 t/y
Frequency and duration of use	
continuous production	
Emission days	360 d/y
Other operational conditions affecting environmental exposure	
Discharge volume of sewage treatment plant	2000 m3/d (EUSES default value for standard local STP)
Available river water volume to receive the emissions from a site	20.000 m3/d (Standard ERC flow rate leading to a 10 fold dilution in receiving waters.)
Risk management measures related to environmental emissions from industrial sites	
Onsite pre-treatment of waste water	Waste waters are generally treated by on site WWTP which will be neutralised before it reaches the biological tower of the WWTP or will be treated on site by chemical neutralisation methods before release to the municipal STP or to the environment.
Resulting fraction of initially applied amount in waste water released from site to the external sewage system	The neutralisation process is extremely efficient and pH monitors are in place to ensure that complete neutralisation and removal have taken place.
Air emission abatement	Treated by scrubbers .

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Onsite waste treatment	The waste water neutralisation process is extremely efficient with almost total neutralisation achieved. pH alarms are in place to ensure that successful neutralisation has taken place.
Effluent (of the waste water treatment plant) discharge rate	2000 m ³ / d (default value)
Recovery of sludge for agriculture or horticulture	No All sludge is collected and incinerated or sent to landfill.
Fractions of substance in waste and waste management measures	
Amount of substances in waste water resulting from identified uses covered in the exposure scenario	0 kg/d (value based on the specialised waste water treatment procedures)
Amount of substances in waste resulting from service life of articles	Not applicable
Type of waste, suitable waste codes	Suitable EWC code(s)
Type of external treatment aiming at recycling or recovery of substances	None
Type of external treatment aiming at final disposal of the waste	Incineration or landfill.
Fraction of substance released into the environment via air from waste handling	Not applicable
Fraction of substance released into the environment via waste water from waste handling	Not applicable
Fraction of substance disposed of as secondary waste	Not applicable

Section 3 Exposure estimation

3.1 Health

ECETOC TRA model to conduct a Tier 1 assessment of inhalation exposure concentrations

ECETOC TRA Model input parameters:

	Parameter
Molecular weight	80,06 g/ mol
Vapour pressure	9730 Pa
Is the substance a solid?	No: liquid
Dustiness during process	Not applicable
Duration of activity	> 4 h
Use of ventilation	Indoors with LEV
Respiratory protection	Yes with an efficiency of at least 95%a

The ECETOC exposure estimation is considered to be unsatisfactory and is not considered relevant for risk characterisation purposes.

ART model to conduct a Tier 2 assessment of inhalation exposure concentrations

ART Model input parameters:

	PROC	Parameters/assumptions
Exposure duration	All	480 minutes
Product type	All	Liquid
Process temperature	1,	Hot processes (50-150°C)
	8b, 9	Room temperature (15-25°C)
Vapour pressure	All	9730 Pa

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Liquid weight fraction	All	10-50%
Primary emission source proximity	All	Primary emission source is located in the breathing zone of the worker (i.e. Within a metre)- the assessment for this activity involves a primary far-field emission source only (workers are in a control room)
Activity class	All	Transfer of liquid products
Containment	1, 9	The handling of sulphur trioxide is such that contact between product and adjacent air is reduced and submerged loading is used reducing the amount of aerosol formation
	8b	Not applicable
Localized controls	All	Local exhaust ventilation systems (LEV) and vapor recovery system
Segregation	1, 9	Complete segregation of workers in separate control room
	8b	Partial segregation of workers
Fugitive emission sources	All	Process fully enclosed – not breached for sampling
Dispersion	1	Outdoors not close to buildings, workers located at a distance from the source greater than 4 meters
	3, 4, 8b	Outdoors near to buildings, workers located at a distance from the source greater than 4 meters
	9	Indoors, any sized room, only good natural ventilation

The estimated short and long-term concentrations are lower than relevant DNEL for all process categories.

3.2 Environment

Tier 1 assessment has been carried out applying EUSES model with standard input data and ERC.

Tier 1 assessment resulted a not realistic exposition.

Tier 2 assessment has been carried out applying EUSES model; refined inputs are chosen to best suit the description of the production and uses of sulfuric trioxide

EUSES model input parameters

Input parameter	Value	Unit	ERC default (if applicable)
Molecular weight	80.06	g/mol	
Vapour pressure at 20°C	9730	Pa	
Water solubility	1000	mg/l	
Octanol/water partition coefficient	-1	LogKow	
Koc	1		
Biodegradability	Not biodegradable		
Life Cycle Step	Formulation		
Environmental Release Class	ERC2		
Fraction of Tonnage for Region (1 Tier)			1

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STP			Yes
Emission events per year	330	days	20
Default Release to Air	2,5	%	2,5
Default Release to water	2	%	2
Dilution factor applied for PEC derivation			10 (20.000 m3/d)
Tonnage assessed	Local: 75.000	tonnes/ year	Worst case for each site

RMMs and measured values for tier 2 assessment.

Description of RMM	Details	Effect taken into account in EUSES	Comments
No loss to waste water	0 mg/l	Lowering of concentration in STP effluent to 0 mg/L due to conversion of trioxide to sulphuric acid, and the very efficient neutralization process	Total neutralization to around pH 7.
Emission days	360 emission days per year	Increase emission days by 20%.	Continuous production
Sludge removal	Sludge removed to landfill or incinerated.	Concentration in soil due to sludge spreading set to 0.	No contamination of grassland or agricultural soil.

All estimated concentrations are lower than relevant PNEC

Section 4 Guidance to check compliance with exposure scenario

4.1 Health

Estimated workplace exposures are not expected to exceed DNELs when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 3.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

4.2 Environment

Estimated exposures are not expected to exceed PNEC when the identified Risk Management Measures/Operational Conditions are adopted, as indicated in Section 3
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.