

MONOSAL 30**SECTION 1: Identification of the substance/mixture and of the company/undertaking****1.1. Product identifier**

MONOSAL 30, hereinafter referred to as "the product" or "the substance" is chemical substance based on a solid iron sulphate monohydrate; CAS N° 17375-41-6, EINECS N° 231-753-5, REACH Registration N° 01-2119513203-57-0001.

1.2. Relevant identified uses of the substance and uses advised against

Relevant identified uses: precursor for iron oxides, sulphates and other iron compounds production; raw and potable water treatment; waste water and waste water sludge treatment; biogas from wastes processing treatment; reduction Cr^{VI} during cement production; metal finish; mineral supplement of feeding mixtures from the trace element category; the laboratory chemical; agrochemical; fillers/lutes and paints production.

Uses advised against: moss killer.

1.3. Details of the supplier of the safety data sheet

Producer and supplier: PRECHEZA a.s

Site: nábrž. Dr. Edvarda Beneše 1170/24, Přerov I-Město, 750 02 Přerov, Czech Republic

Phone: +420 581 235 837; GSM: +420 602 752 216; Fax: +420 581 706 830

E-mail: sds@precheza.cz; URL: www.precheza.cz

1.4. Emergency telephone number

PRECHEZA a.s.: +420 581 252 356, +420 602 783 708 (24/7)

POISON CENTER: Na bojišti 1, 128 02 Prague 2; phone +420 224 919 293 or +420 224 915 402 (24/7)

SECTION 2: Hazards identification**2.1. Classification of the substance or mixture**

Acute Tox. 4; H302

Eye Irrit. 2; H319

Skin Irrit. 2; H315

2.2. Label elements

Signal word: **Warning**

Pictogram: **GHS07**

H phrases: **H302:** Harmful if swallowed.

H315: Causes skin irritation.

H319: Causes serious eye irritation.

P phrases: **P280:** Wear protective gloves/protective clothing/eye protection/face protection.

P301+P312: IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.

P302+P352: IF ON SKIN: Wash with plenty of soap and water.

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

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

P501: Dispose of contents/container to an approved waste disposal plant.



Remark: The substance is subject to harmonized classification.

2.3. Other hazards

Not applicable.

SECTION 3: Composition/information on ingredients**3.1. Substances**

Description: Chemical substance based on Iron-II-Sulphate

3.2. Mixtures

Not applicable.

Safety Data Sheet MONOSAL 30

Edition 13 (EN), valid since 01 OCT 2016 until cancelled

Repeals Safety Data Sheet MONOSAL 30, 12th edition (EN), valid since 01 JUN 2015

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Revision: see SECTION 16

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SECTION 4: First aid measures

4.1. Description of first aid measures

General measure: Consult a doctor in case of persistent difficulties.

Inhalation: Move to fresh air. If breathing is difficult, oxygen may be beneficial if administered by trained personnel. Get medical attention.

Skin/hairs contact: Remove contaminated clothing and shoes. Flush skin with plenty of water and soap. Get medical attention. Wash contaminated clothing before reuse.

Eye contact: Remove contact lenses, if present and easy to do it. Flush eyes with plenty of water for at least 10 minutes. Get medical attention if symptoms occur.

Ingestion: Call a doctor immediately. Rinse mouth with water. Have victim drink 240 to 300 ml water, if conscious. Vomiting has not to be induced. Get medical attention.

4.2. Most important symptoms and effects, both acute and delayed

Big amount swallowed induces vomiting, laxation (diarrhoea) and blood pressure fall.

4.3. Indication of any immediate medical attention and special treatment needed

Based on available data none is known.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media: Water stream, water fog, foam, dust, CO₂.

Unsuitable extinguishing media: Based on available data, none are known.

5.2. Special hazards arising from the substance or mixture

Heating above decomposition temperature can create sulphur oxides (SO₂ and SO₃).

5.3. Advice for firefighters

Based on available data, none special protective actions to be taken during firefighting are known. Use appropriate personal protective equipment (PPE) with regards to the risks, approved by professional specialist.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Based on available data, neither special actions nor targeted training shall be taken. Keep unnecessary and unprotected personnel from entering. Provide adequate ventilation. Hazard of slipping on spilt wet product. Use appropriate personal protective equipment (PPE, see SECTION 7) with regards to the risks, approved by professional specialist.

6.2. Environmental precautions

Seal the place of leaking and prevent it leaking into the environment. Inform relevant authorities if a contamination of rivers, lakes or water sources occurs.

6.3. Methods and materials for containment and cleaning up

Prevent dusting. Neutralise with lime. The produced powder mixture has to be removed into approved container using any feasible mechanical means and disposed of in landfills in accordance with local environmental regulations. Contaminated water has to be neutralised in the industrial waste water treatment plant. See SECTION 13 for disposal considerations.

6.4. Reference to other sections

See SECTION 1 for emergency contact information. See SECTION 8 for exposure controls/personal protection. See SECTION 13 for disposal considerations.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Handling: Keep good industrial hygiene practice for handling chemical mixtures. Handle under ventilation wearing appropriate PPE approved by professional specialist (see SECTION 8.2.2).

Avoid contact with eyes and skin/hairs. Avoid dusting and inhalation of dust.

Technical measures: Use engineering controls such as isolation, enclosures, exhaust ventilation, wetting and dust collection to control airborne dust concentrations.

[Warnings: See SECTION 2.](#)

Advice on usage: Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required. IF exposed or concerned: Get medical advice/attention.

7.2. Conditions for safe storage, including any incompatibilities

Store locked up. Store separated from other materials in a usual warehouse. Do not store outside. Take care to avoid wetting, freezing, high temperatures above 300 °C and contact with incompatible materials

Packing materials: Use original containers. Use plastics (PE, PP, PVC), laminates, epoxy coated concrete, acid proof/rubber-coated steel.

Incompatible materials: Solvents, non-acid proof metals (Al, Cu, Fe), alkalis, non-noble alloys, galvanic coats.

7.3. Specific end use(s)

Based on available data none are known.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

DNEL (skin, long-term, operator in production): 7.60 mg/kg bw/day

DNEL (skin, long-term, end user): 3.80 mg/kg bw/day

DNEL (oral, long-term, end user): 0.76 mg/kg bw/day

DNEL (oral, acute, end user): 20.0 mg/kg bw/day

8.2. Exposure controls

8.2.1 Appropriate engineering controls

The set of specific measures is relevant to appropriate exposure scenarios. Collectively, engineering controls and system of work safety shall be used to minimise the risk of exposure. The processing lines must be sealed to prevent any leakage. Dust reduction equipment must be used when filling the transport containers. Regarding the local prescriptions, the effectivity of ventilation should be requested. The operating staff must be qualified on the basis of education and training.

8.2.2 Individual protection measures, such as personal protective equipment (PPE)

Eye/face protection: Use appropriate protective goggles or face shield.

Hand protection: Use protective gloves (PVC, neoprene, rubber; penetration time >480 min.).

Consider the local conditions of use of the gloves, as danger of rupture, abrasion and time of the contact of the product with the gloves.

Skin/hairs protection: Use appropriate PPE with regards to the risks, approved by professional specialist.

Respiratory protection: Use dust-protection mask, filter B/P2.

Thermal hazards: Based on available data, none are known.

Hygiene measures: Handling chemical substances, wash hands, forearms and face before eating, smoking and chewing. Use the lavatory at the end of the working period. Appropriate technique shall be used to remove contaminated clothing. Wash contaminated clothing before reuse. Ensure that eyewash stations and safety showers are located close to the workstation.

8.2.3 Environmental exposure controls

Check emissions from ventilation or work process equipment to ensure they comply with the requirements of environmental protection legislation. Fume scrubbers, filters or engineering modifications to the process equipment will be necessary in some cases to reduce emissions to acceptable level.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

a) Appearance (20°C, 1013 hPa): Solid, fine crystalline grey up to brownish powder

b) Odour: Odourless

c) Odour threshold: Based on available data it is not applicable

d) pH value at 20°C: Based on available data it is not applicable

e) Melting/freezing point (°C): Decomposition above 300 °C without melting

f) Boiling point (°C): Based on available data it is not applicable

g) Flash point: Based on available data it is not applicable

h) Evaporation rate: Based on available data it is not applicable

i) Flammability (solid, gas): Based on available data it is not applicable

j) Upper/lower flammability or explosive limits: Based on available data it is not applicable

k) Vapour pressure: Based on available data it is not applicable

- l) Vapour density: Based on available data it is not applicable
- m) Relative density (at 20°C): 2650 kg/m³ (bulk density 1450 kg/m³)
- n) Solubility in water: 295 kg/m³ at 25 °C
- o) Partition coefficient n-octanol/water: Based on available data it is not applicable
- p) Auto-ignition temperature: Based on available data it is not applicable
- q) Decomposition temperature: It decomposes at temperatures above 300 °C with creation Fe₂O₃, SO₂ a SO₃.
- r) Viscosity (at 20 °C): Based on available data it is not applicable
- s) Explosive properties: Based on available data it is not applicable
- t) Oxidising properties: Based on available data it is not applicable

9.2. Other information

Based on available data none are known.

SECTION 10: Stability and reactivity

10.1. Reactivity

Based on available data, none danger of reactivity is known.

[Chemical reaction with water: Based on available data, none danger is known.](#)

10.2. Chemical stability

Based on available data, the product is stable under standard conditions. It decomposes at temperatures above 300 °C with creation of Fe₂O₃, SO₃ and SO₂.

10.3. Possibility of hazardous reactions

Thermal decomposition with creation of SO₃ and SO₂.

[Danger other than fire: Based on available data, no such danger is known.](#)

[Dust explosion: Based on available data, no such danger is known.](#)

10.4. Conditions to avoid

Wetting. Freezing. High temperatures above 300 °C.

10.5. Incompatible materials

Solvents, non-acidproof metals (Al, Cu, Fe), alkalis, non-noble alloys, galvanic coats.

10.6. Hazardous decomposition products

Degradation products (SO₃ and SO₂) irritate mucosa and respiratory tract.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

- a) Acute toxicity: oral – adverse effect was observed at LD₅₀ ≥ 670 mg/kg bw (tests made on animals); skin – adverse effect was not observed (discrimination dose 2000 mg/kg bw); inhalation – adverse effect was nor observed (discrimination concentration 1100 mg/m³).
- b) Skin corrosion/irritation: based on tests made on animals it causes skin irritation.
- c) Serious eye damage/irritation: based on tests made on animals it causes eye irritation.
- d) Respiratory or skin sensitisation: skin – according to the tests made on animals no sensitisation; respiratory tract – no data available, based on available data the classification criteria are not met.
- e) Germ cell mutagenicity: none adverse effects were observed, based on available data the classification criteria are not met.
- f) Carcinogenity: The substance is not classified, no data available.
- g) Reproductive toxicity: oral - NOAEL ≥ 1000 mg FeSO₄·7 H₂O/kg bw/day for reproductive toxicity/teratogenicity (OECD TG 422); dermal and inhalation – no data available, based on available data the classification criteria are not met.
- h) STOT-single exposure: none reversible or irreversible effects were observed after oral exposition immediately or delayed; based on available data the classification criteria are not met.
- i) STOT-repeated exposure: oral – according to the tests made on animals effects at 163.9 mg/kg bw/day, NOAEL = 54.6 mg/kg bw/day, LOAEL = 163.9 mg/kg bw/day for dry FeSO₄; dermal and inhalation – no data available; based on available data the classification criteria are not met.
- j) Aspiration hazard: Based on available data the classification criteria are not met.

SECTION 12: Ecological information

12.1. Toxicity

Based on available data, it is not known.

12.2. Persistence and degradability

Based on available data, no persistence is known. See SECTION 9 for degradability and solubility.

12.3. Bioaccumulative potential

Based on available data, the substance is not considered as bioaccumulative.

12.4. Mobility in soil

Based on available data, the substance is not considered as mobile in soil.

12.5. Results of PBT and vPvB assessment

Based on available data the substance is not considered either PBT or vPvB.

12.6. Other adverse effects

Based on available data the substance has none other adverse effects like effect on environmental fate (exposure), photochemical ozone creation potential, ozone depletion potential, endocrine disrupting potential and/or global warming potential.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Product residues/deteriorated product: Based on available data they are not classified as dangerous waste. Check the possibilities for re-utilization. If unusable, pack, label and dispose/recycle according to the applicable national and local regulations. Where large quantities are concerned, consult the supplier.

Industry – Possibility of recovery/recycling: Recovery by filtration, recovery by mechanically collection. Industry – Possibility of neutralisation: Not applicable. Industry – Possibility of destruction: Controlled discharge: Removal by controlled dumping at a licensed landfill. Industry – Possibility of destruction – incineration: Not applicable. Industry – Possibility of destruction – water purification: Not applicable. Industry – Possibility of destruction – other: Not applicable. Public at large – Possibility of recovery/recycling: Not applicable. Public at large – Possibility of neutralisation: Not applicable. Public at large – Possibility of destruction: Controlled discharge: Not applicable. Public at large – Possibility of destruction – incineration: Not applicable. Public at large – Possibility of destruction – water purification: Not applicable. Public at large – Possibility of destruction – others: Not applicable.

Uncleansed packages: Based on knowledge, they are not classified as hazardous waste. When passed on, the recipient must be warned of any possible hazard that may be caused by residues. If recycling is not possible, dispose according to the applicable national and local regulations.

SECTION 14: Transport information

14.1. UN number

Based on available data it is not applicable.

14.2. UN proper shipping name

Based on available data it is not applicable.

14.3. Transport hazard class(es)

Based on available data it is not applicable.

14.4. Packing group

Based on available data it is not applicable.

14.5. Environmental hazards

Based on available data the criteria for classification according to the UN regulations (IMDG, ARD, RID and ADN) are not met.

14.6. Special precautions for user

See SECTION 2 for classification, labelling and H/P clauses. See SECTION 4 for first aid measures. See SECTION 5 for firefighting measures. See SECTION 6 for accidental release measures. See SECTION 7 for safe handling and storage precautions. See SECTION 8 for exposure controls and personal protection.

14.7. Transport bulk according to Annex II of Marpol and the IBC Code
Based on available data it is not recommended.

SECTION 15: Regulatory information

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

Based on available data, Regulation (EC) No. 1907/2006 (REACH) Annex XVII – Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles, in valid wording, is not applicable.

15.2. Chemical safety assessment

The producer has carried out chemical safety assessment for the substance.

SECTION 16: Other information

Changes have been made to the previous version (SECTIONS 7, 8, 10 and 16) were based on implementation of requirements of Commission Regulation (EU) No 2015/830. No changes in exposure scenarios were made.

Revision of this Safety Data Sheet

This Safety Data Sheet is revised by the manufacturer after every 12 months after the date of validity and/or if new information with influence on risk assessment is available and/or permitting/restriction given. If it conforms, it stays in use, among other on internet pages of manufacturer www.precheza.cz. If it does not conform, it is updated and issued again with increased number of edition.

Key literature/information references and sources:

Regulation (EC) No 1907/2006 of the European Parliament and of the Council, concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive No 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive No 76/769/EEC and Commission Directives No 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC

Regulation (EC) No 1272/2008 of the European Parliament and of the Council on classification, labelling and packaging of substances and mixtures, amending and repealing Directives No 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006

Commission Regulation (EU) 2015/830 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

CZ Act No 254/2001 Coll. about waters, in valid wording

CZ Act No 185/2001 Coll. about wastes, in valid wording

CZ Act No 262/2006 Coll. about labour law, in valid wording

CZ Act No 309/2006 Coll. about assurance of conditions of OS/OH, in valid wording

CZ Act No 361/2007 Coll. establishing conditions of OS/OH, in valid wording

Safety Data Sheets of raw material suppliers

Safety Data Sheets of analogous products

ECHA documentation

Database PhysProp; <http://esc.syrres.com/interkow>

Ecotoxicological database; <http://www.piskac.cz/ETD>

Database ICSC (WHO/IPCS/ILO); <http://www.cdc.gov/niosh/ipcs>

Chemical Safety Report, Iron Sulphate, PRECHEZA a.s. (2010)

Relevant hazard statements and/or precautionary statements

H302: Harmful if swallowed.

H315: Causes skin irritation.

H319: Causes serious eye irritation.

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

P301+P312: IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.

P302+P352: IF ON SKIN: Wash with plenty of soap and water.

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

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

P501: Dispose of contents/container to an approved waste disposal plant.

Advice on training appropriate for workers to ensure protection of human health and the environment

Keep all rules valid for handling chemical substances and mixtures.

The product described in this Safety Data Sheet is designed for industrial and related applications only (e.g. research and development) by aware and capable staff.

Information included in this document is given in good faith with accentuation that:

- ★ not relevant and/or not applicable and/or known legal and/or other requirements and/or qualitative attributes of the product, are stated as as „not relevant“, „not applicable“, „not known“ or „N/A“ in this Safety Data Sheet;*
- ★ all requirements and/or qualitative attributes of the product, which are not known by the supplier of this Safety Data Sheet are stated as „not known“ or „not applicable“ or „N/A“ in this Safety Data Sheet;*
- ★ all the hereby given data reflects the best recent stage of knowledge relevant to safety and hygienic requirements;*
- ★ all the hereby given data cannot be used for mixtures of hereby mentioned product with other products and/or as the warranty of the product quality and cannot be used for complaints;*
- ★ former application tests are necessary before any use of the hereby mentioned product;*
- ★ all relevant and known regulations and rules for handling chemical substances and mixtures have to be kept in case of use, handling and/or transport the hereby mentioned product;*
- ★ the exploitation of hereby mentioned information is not controlled by the producer; the producer does not accept responsibility for any injury and/or damage when/where hereby mentioned product is used by incompetent manner and/or in applications other than recommended and/or identified;*
- ★ the user of the hereby mentioned product is responsible to respect all relevant industrial and other rights related to the hereby mentioned product.*

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EXPOSURE SCENARIO # 1 OF CHEMICAL SAFETY REPORT

1. Short title of the exposure scenario		
Manufacturing and industrial application of powdery solid iron salt products that may lead to significant dust formation		
2. Processes and activities covered by the exposure scenario		
<p>The ES describes the manufacture and industrial use of iron(II) sulphate (FeSO4, ferrous sulphate) which may be supplied as solids in various hydration states.</p> <p>The solid substance or solid mixtures containing them may be transferred in enclosed or open dedicated or non-dedicated systems in large or small amounts, be blended and mixed with other substances in enclosed or open vessels and be used for different purposes in closed or open continuous or batch processes. Finally, the solid substances or solid and wetted mixtures containing them may be processed by compaction, forming of pellets or tablets, etc.</p> <p>The ES is applicable to the manufacture of iron sulphates, generic formulation involving solids and including pelletisation, use as a reactive product/ precursor, treatment of raw and potable water, treatment of waste water and sewage sludge, biogas treatment and waste treatment plants, manufacture and industrial use of cements, industrial use as laboratory agent, industrial use of adhesives, sealants and coatings, manufacture of products for land remediation applications, manufacture of agrochemicals.</p>		
Sector of Use (SU)	SU 8	Manufacture of bulk, large scale chemicals
	SU 9	Manufacture of fine chemicals
	SU 10	Formulation (mixing) of preparations and/or re-packaging
	SU 13	Manufacture of non-metallic mineral products (plasters, cement)
	SU 14	Manufacture of basic metals, including alloys
	SU 15	Manufacture of fabricated metal products, except machinery and equipment
	SU 16	Manufacture of computer, electronic and optical products, electrical equipment
	SU 19	Building and construction work
	SU 24	Scientific research and development
Product Category (PC) Not applicable		
Process Category (PROC)	PROC 1	Closed process without breaching
	PROC 2	Use in closed, continuous processes with controlled exposure
	PROC 3	Use in closed batch process
	PROC 4	Use in batch and other processes with possibility of significant exposure
	PROC 5	Mixing and blending in batch processes
	PROC 8a	Transfer at non-dedicated facilities
	PROC 8b	Transfer at dedicated facilities
	PROC 9	Transfer into small containers
	PROC 14	Production of preparations and articles by tableting, compression, extrusion, pelletisation
	PROC 15	Use as laboratory agent
	PROC 22	Potentially closed processing operations with minerals and metals at elevated temperature
	PROC 26	Handling of solid inorganic substances at ambient temperature
Article Category (AC)	AC 01	Adhesive, sealant and coating
	AC 4	Stone, plaster, cement, glass and ceramic articles
Environment Release Category (ERC)	ERC 1	Manufacture of substances
	ERC 2	Formulation of preparations
	ERC 4	Industrial use of processing aids in processes and products, not becoming part of articles
	ERC 5	Industrial use resulting in inclusion into or onto a matrix
	ERC 6a	Industrial use resulting in manufacture of another substance (use of intermediates)
	ERC 6b	Industrial use of reactive processing aids
3. Operational conditions and risk management measures		
Product characteristics	Solid powdery iron salt products that are manufactured, transferred, formulated, re-packaged, bagged, delivered to and handled by industrial downstream users.	
Used amount of substance	It may range from a few hundred kilograms to hundreds of tonnes per day. In some cases such as the laboratory use, a few grams may be used per day. In the assessment of environmental exposure, a typical use amount of 25 g iron per m³ waste water and a reasonable highest use amount of 250 g iron per m³ waste water were considered.	
3.1 Controlling environmental exposure		
Frequency and duration of	300 to 365 days a year; continuously or as batch processes.	

use	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Equipment with dust abatement techniques to avoid atmospheric emissions as much as possible. The most common abatement techniques include bag filters or wet scrubbing units. The waste water produced in the processes and containing dissolved iron salts as well as heavy metal impurities is either recycled in the processes or collected and treated, for example by means of precipitation, before released to further waste water treatment or the environment.
Conditions and measures related to industrial waste water treatment (onsite or external)	The volume of waste water emitted per day is 2000 m ³ for the majority of processes (the standard condition in EUSES). The volumetric waste water flow can be changed by using the appropriate equation for scaling of the risk characterisation ratios.
Conditions and measures related to external recovery of waste	Industrial waste water produced at the sites is treated by precipitation to remove iron and heavy metal impurities. The resulting solids are disposed of mainly in landfills according to local environmental regulations.

3.2 Controlling worker exposure

Frequency and duration of use	Daily exposure occurring during a full working shift of 8 hours. A worker may be exposed on 220 days per year under normal conditions.
Human factors not influenced by risk management	The worker under normal conditions has a breathing rate of 10 m ³ per 8 hour shift. The exposed skin area per activity was used as defined in the MEASE exposure assessment tool.
Technical conditions and measures at process level (source) to prevent release	Processes, namely those involving the use of chlorine, hydrochloric, sulphuric or nitric acids, are operated in enclosed systems.
Technical conditions and measures to control dispersion from source towards the worker	The facilities where solid iron salt products are directly handled by workers should be equipped with efficient local exhaust ventilation systems.
Conditions and measures related to personal protection, hygiene and health evaluation	In the absence of local exhaust ventilation workers directly handling solid iron salt products should wear respiratory mask with appropriate dust filters. Workers directly handling solid iron salt products should wear chemical resistant gloves and safety goggles as well as appropriate working clothes and boots.

3.3 Controlling consumer exposure

No consumer exposure is anticipated with the industrial activities described in this exposure scenario.

3.4 Controlling exposure during the service life of articles

Since the iron salts will be bound into the solid matrix of articles, no release of iron salts from articles during the service life is anticipated under reasonable use conditions.

4. Exposure estimation

4.1 Worker exposure

Exposure estimates calculated with the MEASE modelling tool.

Acute exposure

Estimated acute inhalation exposure of industrial workers to powdery solid iron salt products

Process category	LEV	Mask	Inhalation exposure in mg/m ³ taking RMMs into account (based on product containing >25 % iron salt)
PROC 1	No	No	0.020
PROC 2	No	No	2.000
PROC 3	No	No	2.000
PROC 4	90 %	No	5.000
PROC 5	90 %	No	5.000
PROC 8a	90 %	No	10.000
PROC 8b	95 %	No	2.500
PROC 9	90 %	No	4.000
PROC 14	90 %	No	4.000
PROC 15	90 %	No	2.000
PROC 22	90 %	No	1.400
PROC 26	82 %	No	3.600

Long-term exposure

Occupational long-term inhalation exposure to iron salts resulting from industrial use of products

Process category	Duration in minutes	LEV	Respiratory mask	Predicted exposure to pure iron salt; no RMMs [mg/m ³]	Inhalation exposure in mg/m ³ taking RMMs into account (based on product containing >25 % iron salt)
PROC 1	> 240	No	No	0.01	0.01
PROC 2	> 240	No	No	1	1.00
PROC 3	> 240	No	No	1	1.00
PROC 4	> 240	90 %	No	25	2.50
PROC 5	> 240	90 %	No	25	2.50
PROC 8a	> 240	95 %	No	50	2.50
PROC 8b	> 240	95 %	No	25	1.25
PROC 9	> 240	90 %	No	20	2.00
PROC 14	> 240	90 %	No	10	1.00
PROC 15	> 240	90 %	No	5	0.50
PROC 22	> 240	90 %	No	7	0.70
PROC 26	> 240	82 %	No	10	1.80

Occupational dermal exposure to iron salts resulting from industrial use of products (independent of particle size of products)

PROC	Pattern of control				Dermal load in mg/cm ² ; Dermal dose in mg/kg bw/day (for 70 kg)									Exposed skin area in cm ²
	Pattern of use	Exposure control	Contact level	Use of gloves	C > 25 %		C = 5 to 25 %		C = 1 to 5 %		C = < 1 %			
					Load	Dose	Load	Dose	Load	Dose	Load	Dose		
1	Closed system without breaches	Non-direct handling	None	No	0.0005	0.0017	0.0003	0.0010	0.0001	0.0003	0.00005	0.0002	240	
2	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480	
3	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0017	0.0003	0.0010	0.0001	0.0003	0.00005	0.0002	240	
4	Wide dispersive use	Direct handling	Extensive	No	0.5	3.4286	0.3	2.0571	0.1	0.6857	0.05	0.3429	480	
				Yes	0.05	0.3429	0.03	0.2057	0.01	0.0686	0.005	0.0343		
5	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480	
8a	Wide dispersive use	Direct handling	Extensive	No	0.5	6.8571	0.3	4.1143	0.1	1.3714	0.05	0.6857	960	
				Yes	0.05	0.6857	0.03	0.4114	0.01	0.1371	0.005	0.0686		
8b	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480	
9	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480	
14	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480	
15	Non-dispersive use	Direct handling	Incidental	No	0.005	0.0171	0.003	0.0103	0.001	0.0034	0.0005	0.0017	240	
22	Non-dispersive use	Direct handling	Intermittent	No	0.005	0.1414	0.003	0.0849	0.001	0.0283	0.0005	0.0141	1980	
26	Wide dispersive use	Direct handling	Extensive	No	0.5	14.143	0.3	8.4857	0.1	2.8286	0.05	1.4143	1980	
				Yes	0.05	1.4143	0.03	0.8486	0.01	0.2829	0.005	0.1414		

4.2 Environmental exposure

Aquatic environment

Negligible emissions of iron into the aquatic environment are anticipated with the identified uses of iron salt products.

Terrestrial environment
Iron directly introduced into the terrestrial environment as a result of the use of iron salt products will not significantly alter the generally high natural background concentrations of this metal.
Atmospheric environment
The iron salts have very low vapour pressures. No significant formation of aerosols or dusts containing iron salts is anticipated with the identified uses of iron salt products.

EXPOSURE SCENARIO # 2 OF CHEMICAL SAFETY REPORT

1. Short title of the exposure scenario		
Manufacturing and industrial application of granular solid iron salt products that may lead to moderate dust formation		
2. Processes and activities covered by the exposure scenario		
<p>The ES describes the manufacture and industrial use of iron(II) sulphate (FeSO₄, ferrous sulphate) which may be supplied as solids in various hydration states.</p> <p>The solid substance or solid mixtures containing them may be transferred in enclosed or open dedicated or non-dedicated systems in large or small amounts, be blended and mixed with other substances in enclosed or open vessels and be used for different purposes in closed or open continuous or batch processes. Finally, the solid substances or solid and wetted mixtures containing them may be processed by compaction, forming of pellets or tablets, etc.</p> <p>The ES is applicable to the manufacture of iron sulphates, generic formulation involving solids and including pelletisation, use as a reactive product/ precursor, treatment of raw and potable water, treatment of waste water and sewage sludge, biogas treatment and waste treatment plants, manufacture and industrial use of cements, industrial use as laboratory agent, industrial use of adhesives, sealants and coatings, manufacture of products for land remediation applications, manufacture of agrochemicals.</p>		
Sector of Use (SU)	SU 8	Manufacture of bulk, large scale chemicals
	SU 9	Manufacture of fine chemicals
	SU 10	Formulation (mixing) of preparations and/or re-packaging
	SU 13	Manufacture of non-metallic mineral products (plasters, cement)
	SU 14	Manufacture of basic metals, including alloys
	SU 15	Manufacture of fabricated metal products, except machinery and equipment
	SU 16	Manufacture of computer, electronic and optical products, electrical equipment
	SU 19	Building and construction work
	SU 24	Scientific research and development
Product Category (PC)	Not applicable	
Process Category (PROC)	PROC 1	Closed process without breaching
	PROC 2	Use in closed, continuous processes with controlled exposure
	PROC 3	Use in closed batch process
	PROC 4	Use in batch and other processes with possibility of significant exposure
	PROC 5	Mixing and blending in batch processes
	PROC 8a	Transfer at non-dedicated facilities
	PROC 8b	Transfer at dedicated facilities
	PROC 9	Transfer into small containers
	PROC 14	Production of preparations and articles by tableting, compression, extrusion, pelletisation
	PROC 15	Use as laboratory agent
	PROC 22	Potentially closed processing operations with minerals and metals at elevated temperature
	PROC 26	Handling of solid inorganic substances at ambient temperature
Article Category (AC)	AC 01	Adhesive, sealant and coating
	AC 4	Stone, plaster, cement, glass and ceramic articles
Environment Release Category (ERC)	ERC 1	Manufacture of substances
	ERC 2	Formulation of preparations
	ERC 4	Industrial use of processing aids in processes and products, not becoming part of articles
	ERC 5	Industrial use resulting in inclusion into or onto a matrix
	ERC 6a	Industrial use resulting in manufacture of another substance (use of intermediates)
	ERC 6b	Industrial use of reactive processing aids
3. Operational conditions and risk management measures		
Product characteristics	Solid granular iron salt products that are manufactured, transferred, formulated, re-packaged, bagged, delivered to and handled by industrial downstream users.	
Used amount of substance	It may range from a few hundred kilograms to hundreds of tonnes per day. In some cases such as the laboratory use, a few grams may be used per day. In the assessment of environmental exposure, a typical use amount of 25 g iron per m ³ waste water and a reasonable highest use amount of 250 g iron per m ³ waste water were considered.	

3.1 Controlling environmental exposure			
Frequency and duration of use		300 to 365 days a year; continuously or as batch processes.	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil		Equipment with dust abatement techniques to avoid atmospheric emissions as much as possible. The most common abatement techniques include bag filters or wet scrubbing units. The waste water produced in the and containing dissolved iron salts as well as heavy metal impurities is either recycled in the processes or collected and treated, for example by means of precipitation, before released to further waste water treatment or the environment.	
Conditions and measures related to industrial waste water treatment (onsite or external)		The volume of waste water emitted per day is 2000 m³ for the majority of processes (the standard condition in EUSES). The volumetric waste water flow can be changed by using the appropriate equation for scaling of the risk characterisation ratios.	
Conditions and measures related to external recovery of waste		Industrial waste water produced at the sites is treated by precipitation to remove iron and heavy metal impurities. The resulting solids are disposed of mainly in landfills according to local environmental regulations.	
3.2 Controlling worker exposure			
Frequency and duration of use		Daily exposure occurring during a full working shift of 8 hours. A worker may be exposed on 220 days per year under normal conditions.	
Human factors not influenced by risk management		The worker under normal conditions has a breathing rate of 10 m³ per 8 hour shift. The exposed skin area per activity was used as defined in the MEASE exposure assessment tool.	
Technical conditions and measures at process level (source) to prevent release		Processes, namely those involving the use of chlorine, hydrochloric, sulphuric or nitric acids, are operated in enclosed systems.	
Technical conditions and measures to control dispersion from source towards the worker		The facilities where solid iron salt products are directly handled by workers should be equipped with efficient local exhaust ventilation systems.	
Conditions and measures related to personal protection, hygiene and health evaluation		In the absence of local exhaust ventilation workers directly handling solid iron salt products should wear respiratory mask with appropriate dust filters. Workers directly handling solid iron salt products should wear chemical resistant gloves and safety goggles as well as appropriate working clothes and boots.	
3.3 Controlling consumer exposure			
No consumer exposure is anticipated with the industrial activities described in this exposure scenario.			
3.4 Controlling exposure during the service life of articles			
Since the iron salts will be bound into the solid matrix of articles, no release of iron salts from articles during the service life is anticipated under reasonable use conditions.			
4. Exposure estimation			
4.1 Worker exposure			
Exposure estimates calculated with the MEASE modelling tool.			
Acute exposure			
Estimated acute inhalation exposure of industrial workers to powdery solid iron salt products			
Process category	LEV	Mask	Inhalation exposure in mg/m³ taking RMMs into account (based on product containing >25 % iron salt)
PROC 1	No	No	0.020
PROC 2	No	No	2.000
PROC 3	No	No	2.000
PROC 4	90 %	No	5.000
PROC 5	90 %	No	5.000
PROC 8a	90 %	No	10.000
PROC 8b	95 %	No	2.500
PROC 9	90 %	No	4.000
PROC 14	90 %	No	4.000
PROC 15	90 %	No	2.000
PROC 22	90 %	No	1.400
PROC 26	82 %	No	3.600

Long-term exposure													
Occupational long-term inhalation exposure to iron salts resulting from industrial use of products													
Process category	Duration in minutes	LEV	Respiratory mask	Predicted exposure to pure iron salt; no RMMs [mg/m ³]	Inhalation exposure in mg/m ³ taking RMMs into account (based on product containing >25 % iron salt)								
PROC 1	> 240	No	No	0.01	0.01								
PROC 2	> 240	No	No	0.5	0.50								
PROC 3	> 240	No	No	1	1.00								
PROC 4	> 240	90 %	No	5	0.50								
PROC 5	> 240	90 %	No	5	0.50								
PROC 8a	> 240	90 %	No	5	0.50								
PROC 8b	> 240	95 %	No	5	0.25								
PROC 9	> 240	90 %	No	5	0.50								
PROC 14	> 240	No	No	1	1.00								
PROC 15	> 240	No	No	0.5	0.50								
PROC 22	> 240	90 %	No	7	0.70								
PROC 26	> 240	82 %	No	4	0.72								
Occupational dermal exposure to iron salts resulting from industrial use of products (independent of particle size of products)													
PROC	Pattern of control				Dermal load in mg/cm ² ; Dermal dose in mg/kg bw/day (for 70 kg)								
	Pattern of use	Exposure control	Contact level	Use of gloves	C > 25 %		C = 5 to 25 %		C = 1 to 5 %		C = < 1 %		Exposed skin area in cm ²
					Load	Dose	Load	Dose	Load	Dose	Load	Dose	
1	Closed system without breaches	Non-direct handling	None	No	0.0005	0.0017	0.0003	0.0010	0.0001	0.0003	0.00005	0.0002	240
2	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480
3	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0017	0.0003	0.0010	0.0001	0.0003	0.00005	0.0002	240
4	Wide dispersive use	Direct handling	Extensive	No	0.5	3.4286	0.3	2.0571	0.1	0.6857	0.05	0.3429	480
				Yes	0.05	0.3429	0.03	0.2057	0.01	0.0686	0.005	0.0343	
5	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480
8a	Wide dispersive use	Direct handling	Extensive	No	0.5	6.8571	0.3	4.1143	0.1	1.3714	0.05	0.6857	960
				Yes	0.05	0.6857	0.03	0.4114	0.01	0.1371	0.005	0.0686	
8b	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480
9	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480
14	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480
15	Non-dispersive use	Direct handling	Incidental	No	0.005	0.0171	0.003	0.0103	0.001	0.0034	0.0005	0.0017	240
22	Non-dispersive use	Direct handling	Intermittent	No	0.005	0.1414	0.003	0.0849	0.001	0.0283	0.0005	0.0141	1980
26	Wide dispersive use	Direct handling	Extensive	No	0.5	14.143	0.3	8.4857	0.1	2.8286	0.05	1.4143	1980
				Yes	0.05	1.4143	0.03	0.8486	0.01	0.2829	0.005	0.1414	

4.2 Environmental exposure

Aquatic environment

Negligible emissions of iron into the aquatic environment are anticipated with the identified uses of iron salt products.

Terrestrial environment

Iron directly introduced into the terrestrial environment as a result of the use of iron salt products will not significantly alter the generally high natural background concentrations of this metal.

Atmospheric environment

The iron salts have very low vapour pressures. No significant formation of aerosols or dusts containing iron salts is anticipated with the identified uses of iron salt products.

EXPOSURE SCENARIO # 3 OF CHEMICAL SAFETY REPORT

1. Short title of the exposure scenario		
Manufacturing and industrial application of coarse solid iron salt products that may lead to low dust formation		
2. Processes and activities covered by the exposure scenario		
<p>The ES describes the manufacture and industrial use of iron (II) sulphate (FeSO4, ferrous sulphate) which may be supplied as solids in various hydration states.</p> <p>The solid substance or solid mixtures containing them may be transferred in enclosed or open dedicated or non-dedicated systems in large or small amounts, be blended and mixed with other substances in enclosed or open vessels and be used for different purposes in closed or open continuous or batch processes. Finally, the solid substances or solid and wetted mixtures containing them may be processed by compaction, forming of pellets or tablets, etc.</p> <p>The ES is applicable to the manufacture of iron sulphates, generic formulation involving solids and including pelletisation, use as a reactive product/ precursor, treatment of raw and potable water, treatment of waste water and sewage sludge, biogas treatment and waste treatment plants, manufacture and industrial use of cements, industrial use as laboratory agent, industrial use of adhesives, sealants and coatings, manufacture of products for land remediation applications, manufacture of agrochemicals.</p>		
Sector of Use (SU)	SU 8	Manufacture of bulk, large scale chemicals
	SU 9	Manufacture of fine chemicals
	SU 10	Formulation (mixing) of preparations and/or re-packaging
	SU 13	Manufacture of non-metallic mineral products (plasters, cement)
	SU 14	Manufacture of basic metals, including alloys
	SU 15	Manufacture of fabricated metal products, except machinery and equipment
	SU 16	Manufacture of computer, electronic and optical products, electrical equipment
	SU 19	Building and construction work
	SU 24	Scientific research and development
Product Category (PC) Not applicable		
Process Category (PROC)	PROC 1	Closed process without breaching
	PROC 2	Use in closed, continuous processes with controlled exposure
	PROC 3	Use in closed batch process
	PROC 4	Use in batch and other processes with possibility of significant exposure
	PROC 5	Mixing and blending in batch processes
	PROC 8a	Transfer at non-dedicated facilities
	PROC 8b	Transfer at dedicated facilities
	PROC 9	Transfer into small containers
	PROC 14	Production of preparations and articles by tableting, compression, extrusion, pelletisation
	PROC 15	Use as laboratory agent
	PROC 22	Potentially closed processing operations with minerals and metals at elevated temperature
	PROC 26	Handling of solid inorganic substances at ambient temperature
Article Category (AC)	AC 01	Adhesive, sealant and coating
	AC 4	Stone, plaster, cement, glass and ceramic articles
Environment Release Category (ERC)	ERC 1	Manufacture of substances
	ERC 2	Formulation of preparations
	ERC 4	Industrial use of processing aids in processes and products, not becoming part of articles
	ERC 5	Industrial use resulting in inclusion into or onto a matrix
	ERC 6a	Industrial use resulting in manufacture of another substance (use of intermediates)
	ERC 6b	Industrial use of reactive processing aids
3. Operational conditions and risk management measures		
Product characteristics	Solid powdery iron salt products that are manufactured, transferred, formulated, re-packaged, bagged, delivered to and handled by industrial downstream users.	
Used amount of substance	It may range from a few hundred kilograms to hundreds of tonnes per day. In some cases such as the laboratory use, a few grams may be used per day. In the assessment of environmental exposure, a typical use amount of 25 g iron per m³ waste water and a reasonable highest use amount of 250 g iron per m³ waste water were considered.	
3.1 Controlling environmental exposure		
Frequency and duration of	300 to 365 days a year; continuously or as batch processes.	

use	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Equipment with dust abatement techniques to avoid atmospheric emissions as much as possible. The most common abatement techniques include bag filters or wet scrubbing units. The waste water produced in the and containing dissolved iron salts as well as heavy metal impurities is either recycled in the processes or collected and treated, for example by means of precipitation, before released to further waste water treatment or the environment.
Conditions and measures related to industrial waste water treatment (onsite or external)	The volume of waste water emitted per day is 2000 m ³ for the majority of processes (the standard condition in EUSES). The volumetric waste water flow can be changed by using the appropriate equation for scaling of the risk characterisation ratios.
Conditions and measures related to external recovery of waste	Industrial waste water produced at the sites is treated by precipitation to remove iron and heavy metal impurities. The resulting solids are disposed of mainly in landfills according to local environmental regulations.

3.2 Controlling worker exposure

Frequency and duration of use	Daily exposure occurring during a full working shift of 8 hours. A worker may be exposed on 220 days per year under normal conditions.
Human factors not influenced by risk management	The worker under normal conditions has a breathing rate of 10 m ³ per 8 hour shift. The exposed skin area per activity was used as defined in the MEASE exposure assessment tool.
Technical conditions and measures at process level (source) to prevent release	Processes, namely those involving the use of chlorine, hydrochloric, sulphuric or nitric acids, are operated in enclosed systems.
Technical conditions and measures to control dispersion from source towards the worker	The facilities where solid iron salt products are directly handled by workers should be equipped with efficient local exhaust ventilation systems.
Conditions and measures related to personal protection, hygiene and health evaluation	In the absence of local exhaust ventilation workers directly handling solid iron salt products should wear respiratory mask with appropriate dust filters. Workers directly handling solid iron salt products should wear chemical resistant gloves and safety goggles as well as appropriate working clothes and boots.

3.3 Controlling consumer exposure

No consumer exposure is anticipated with the industrial activities described in this exposure scenario.

3.4 Controlling exposure during the service life of articles

Since the iron salts will be bound into the solid matrix of articles, no release of iron salts from articles during the service life is anticipated under reasonable use conditions.

4. Exposure estimation

4.1 Worker exposure

Exposure estimates calculated with the MEASE modelling tool.

Acute exposure

Estimated acute inhalation exposure of industrial workers to powdery solid iron salt products

Process category	LEV	Mask	Inhalation exposure in mg/m ³ taking RMMs into account (based on product containing >25 % iron salt)
PROC 1	No	No	0.020
PROC 2	No	No	2.000
PROC 3	No	No	2.000
PROC 4	90 %	No	5.000
PROC 5	90 %	No	5.000
PROC 8a	90 %	No	10.000
PROC 8b	95 %	No	2.500
PROC 9	90 %	No	4.000
PROC 14	90 %	No	4.000
PROC 15	90 %	No	2.000
PROC 22	90 %	No	1.400
PROC 26	82 %	No	3.600

Long-term exposure

Occupational long-term inhalation exposure to iron salts resulting from industrial use of products

Process category	Duration in minutes	LEV	Respiratory mask	Predicted exposure to pure iron salt; no RMMs [mg/m ³]	Inhalation exposure in mg/m ³ taking RMMs into account (based on product containing >25 % iron salt)
PROC 1	> 240	No	No	0.01	0.01
PROC 2	> 240	No	No	0.01	0.01
PROC 3	> 240	No	No	0.1	0.10
PROC 4	> 240	No	No	0.5	0.50
PROC 5	> 240	No	No	0.5	0.50
PROC 8a	> 240	No	No	0.5	0.50
PROC 8b	> 240	No	No	0.1	0.10
PROC 9	> 240	No	No	0.1	0.10
PROC 14	> 240	No	No	0.1	0.10
PROC 15	> 240	No	No	0.1	0.10
PROC 22	> 240	90 %	No	7	0.70
PROC 26	> 240	No	No	1.5	1.50

Occupational dermal exposure to iron salts resulting from industrial use of products (independent of particle size of products)

PROC	Pattern of control				Dermal load in mg/cm ² ; Dermal dose in mg/kg bw/day (for 70 kg)									Exposed skin area in cm ²
	Pattern of use	Exposure control	Contact level	Use of gloves	C > 25 %		C = 5 to 25 %		C = 1 to 5 %		C = < 1 %			
					Load	Dose	Load	Dose	Load	Dose	Load	Dose		
1	Closed system without breaches	Non-direct handling	None	No	0.0005	0.0017	0.0003	0.0010	0.0001	0.0003	0.00005	0.0002	240	
2	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480	
3	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0017	0.0003	0.0010	0.0001	0.0003	0.00005	0.0002	240	
4	Wide dispersive use	Direct handling	Extensive	No	0.5	3.4286	0.3	2.0571	0.1	0.6857	0.05	0.3429	480	
				Yes	0.05	0.3429	0.03	0.2057	0.01	0.0686	0.005	0.0343		
5	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480	
8a	Wide dispersive use	Direct handling	Extensive	No	0.5	6.8571	0.3	4.1143	0.1	1.3714	0.05	0.6857	960	
				Yes	0.05	0.6857	0.03	0.4114	0.01	0.1371	0.005	0.0686		
8b	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480	
9	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480	
14	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480	
15	Non-dispersive use	Direct handling	Incidental	No	0.005	0.0171	0.003	0.0103	0.001	0.0034	0.0005	0.0017	240	
22	Non-dispersive use	Direct handling	Intermittent	No	0.005	0.1414	0.003	0.0849	0.001	0.0283	0.0005	0.0141	1980	
26	Wide dispersive use	Direct handling	Extensive	No	0.5	14.143	0.3	8.4857	0.1	2.8286	0.05	1.4143	1980	
				Yes	0.05	1.4143	0.03	0.8486	0.01	0.2829	0.005	0.1414		

4.2 Environmental exposure

Aquatic environment

Negligible emissions of iron into the aquatic environment are anticipated with the identified uses of iron salt products.

Terrestrial environment
Iron directly introduced into the terrestrial environment as a result of the use of iron salt products will not significantly alter the generally high natural background concentrations of this metal.
Atmospheric environment
The iron salts have very low vapour pressures. No significant formation of aerosols or dusts containing iron salts is anticipated with the identified uses of iron salt products.

EXPOSURE SCENARIO # 4 OF CHEMICAL SAFETY REPORT

1. Short title of the exposure scenario		
Manufacturing and industrial application of liquid iron salt products		
2. Processes and activities covered by the exposure scenario		
<p>The ES describes the manufacture and industrial use of iron(II) sulphate (FeSO₄, ferrous sulphate) which may be supplied as aqueous solutions of varying concentrations.</p> <p>The liquid mixtures containing iron salts may be transferred in enclosed or open dedicated or non-dedicated systems in large or small amounts, be blended and mixed with other substances in enclosed or open vessels and be used for different purposes in closed or open continuous or batch processes.</p> <p>The ES is applicable to the manufacture of iron sulphates, generic formulation involving solids and including pelletisation, use as a reactive product/ precursor, treatment of raw and potable water, treatment of waste water and sewage sludge, biogas treatment and waste treatment plants, manufacture and industrial use of cements, industrial use as laboratory agent, industrial use of adhesives, sealants and coatings, manufacture of products for land remediation applications, manufacture of agrochemicals.</p>		
Sector of Use (SU)	SU 8	Manufacture of bulk, large scale chemicals
	SU 9	Manufacture of fine chemicals
	SU 10	Formulation (mixing) of preparations and/or re-packaging
	SU 13	Manufacture of non-metallic mineral products (plasters, cement)
	SU 14	Manufacture of basic metals, including alloys
	SU 15	Manufacture of fabricated metal products, except machinery and equipment
	SU 16	Manufacture of computer, electronic and optical products, electrical equipment
	SU 19	Building and construction work
SU 24	Scientific research and development	
Product Category (PC)	Not applicable	
Process Category (PROC)	PROC 1	Closed process without breaching
	PROC 2	Use in closed, continuous processes with controlled exposure
	PROC 3	Use in closed batch process
	PROC 4	Use in batch and other processes with possibility of significant exposure
	PROC 5	Mixing and blending in batch processes
	PROC 7	Industrial spraying
	PROC 8a	Transfer at non-dedicated facilities
	PROC 8b	Transfer at dedicated facilities
	PROC 9	Transfer into small containers
	PROC 10	Roller application or brushing
	PROC 13	Treatment of articles by dipping and pouring
	PROC 15	Use as laboratory agent
Article Category (AC)	AC 01	Adhesive, sealant and coating
	AC 4	Stone, plaster, cement, glass and ceramic articles
Environment Release Category (ERC)	ERC 1	Manufacture of substances
	ERC 2	Formulation of preparations
	ERC 4	Industrial use of processing aids in processes and products, not becoming part of articles
	ERC 5	Industrial use resulting in inclusion into or onto a matrix
	ERC 6a	Industrial use resulting in manufacture of another substance (use of intermediates)
	ERC 6b	Industrial use of reactive processing aids
3. Operational conditions and risk management measures		
Product characteristics	Liquid mixtures containing iron salts that are manufactured, transferred, formulated, re-packaged, loaded and unloaded, delivered to and handled by industrial downstream users.	
Used amount of substance	It may range from a few hundred kilograms to hundreds of tonnes per day. In some cases such as the laboratory use, a few grams may be used per day. In the assessment of environmental exposure, a typical use amount of 25 g iron per m ³ waste water and a reasonable highest use amount of 250 g iron per m ³ waste water were considered.	
3.1 Controlling environmental exposure		
Frequency and duration of use	300 to 365 days a year; continuously or as batch processes.	
Technical onsite conditions	The waste water produced in the and containing dissolved iron salts as well as	

and measures to reduce or limit discharges, air emissions and releases to soil	heavy metal impurities is either recycled in the processes or collected and treated, for example by means of precipitation, before released to further waste water treatment or the environment.
Conditions and measures related to industrial waste water treatment (onsite or external)	The volume of waste water emitted per day is 2000 m ³ for the majority of processes (the standard condition in EUSES). The volumetric waste water flow can be changed by using the appropriate equation for scaling of the risk characterisation ratios.
Conditions and measures related to external recovery of waste	Industrial waste water produced at the sites is treated by precipitation to remove iron and heavy metal impurities. The resulting solids are disposed of mainly in landfills according to local environmental regulations.

3.2 Controlling worker exposure

Frequency and duration of use	Daily exposure occurring during a full working shift of 8 hours. A worker may be exposed on 220 days per year under normal conditions.
Human factors not influenced by risk management	The worker under normal conditions has a breathing rate of 10 m ³ per 8 hour shift. The exposed skin area per activity was used as defined in the MEASE exposure assessment tool.
Technical conditions and measures at process level (source) to prevent release	Processes, namely those involving the use of chlorine, hydrochloric, sulphuric or nitric acids, are operated in enclosed systems.
Technical conditions and measures to control dispersion from source towards the worker	The facilities where liquid mixtures containing iron salts are directly handled by workers should be equipped with efficient local exhaust ventilation systems. Industrial spraying normally is performed in enclosed equipment or areas that may be segregated from the working area to avoid the distribution of aerosols in the air of workplaces.
Conditions and measures related to personal protection, hygiene and health evaluation	Since aqueous solutions of iron salts exhibit irritating or corrosive properties, workers and consumers having direct contact with the solutions need to wear appropriate equipment protecting the skin and the eyes, such as chemical resistant gloves, safety goggles and appropriate working clothes and boots. In the absence of local exhaust ventilation workers directly handling liquid mixtures containing iron salts should wear respiratory masks with appropriate filters. The use of breathing masks is also necessary in situations where workers are directly spraying liquids containing iron salts.

3.3 Controlling consumer exposure

No consumer exposure is anticipated with the industrial activities described in this exposure scenario.

3.4 Controlling exposure during the service life of articles

Since the iron salts will be bound into the solid matrix of articles, no release of iron salts from articles during the service life is anticipated under reasonable use conditions.

4. Exposure estimation

4.1 Worker exposure

Exposure estimates calculated with the MEASE modelling tool.

Acute exposure

Estimated acute inhalation exposure of industrial workers to powdery solid iron salt products

Process category	LEV	Mask	Inhalation exposure in mg/m ³ taking RMMS into account (based on product containing >25 % iron salt)
PROC 1	No	No	0.020
PROC 2	No	No	2.000
PROC 3	No	No	2.000
PROC 4	90 %	No	5.000
PROC 5	90 %	No	5.000
PROC 7	95 %	No	2.000
PROC 8a	90 %	No	10.000
PROC 8b	95 %	No	2.500
PROC 9	90 %	No	4.000
PROC 10	No	No	0.100
PROC 12	No	No	0.002
PROC 13	No	No	0.020
PROC 15	90 %	No	2.000

Long-term exposure

Occupational long-term inhalation exposure to iron salts resulting from industrial use of products													
Process category	Duration in minutes	LEV	Respiratory mask	Predicted exposure to pure iron salt; no RMMs [mg/m³]		Inhalation exposure in mg/m³ taking RMMs into account (based on product containing >25 % iron salt)							
PROC 1	> 240	No	No	0.001		0.001							
PROC 2	> 240	No	No	0.001		0.001							
PROC 3	> 240	No	No	0.01		0.010							
PROC 4	> 240	No	No	0.05		0.050							
PROC 5	> 240	No	No	0.05		0.050							
PROC 7	> 240	95 %	No	20		1.000							
PROC 8a	> 240	No	No	0.05		0.050							
PROC 8b	> 240	No	No	0.01		0.010							
PROC 9	> 240	No	No	0.01		0.010							
PROC 10	> 240	No	No	0.05		0.050							
PROC 12	> 240	No	No	0.001		0.001							
PROC 13	> 240	No	No	0.01		0.010							
PROC 15	> 240	No	No	0.01		0.010							
Occupational dermal exposure to iron salts resulting from industrial use of products (independent of particle size of products)													
PROC	Pattern of control				Dermal load in mg/cm²; Dermal dose in mg/kg bw/day (for 70 kg)								
	Pattern of use	Exposure control	Contact level	Use of gloves	C > 25 %		C = 5 to 25 %		C = 1 to 5 %		C = < 1 %		Exposed skin area in cm²
					Load	Dose	Load	Dose	Load	Dose	Load	Dose	
1	Closed system without breaches	Non-direct handling	None	No	0.0005	0.0017	0.0003	0.0010	0.0001	0.0003	0.00005	0.0002	240
2	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480
3	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0017	0.0003	0.0010	0.0001	0.0003	0.00005	0.0002	240
4	Wide dispersive use	Direct handling	Extensive	No	0.5	3.4286	0.3	2.0571	0.1	0.6857	0.05	0.3429	480
				Yes	0.05	0.3429	0.03	0.2057	0.01	0.0686	0.005	0.0343	
5	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480
7	Wide dispersive use	Direct handling	Extensive	No	0.5	3.4286	0.3	2.0571	0.1	0.6857	0.05	0.3429	480
				Yes	0.05	0.3429	0.03	0.2057	0.01	0.0686	0.005	0.0343	
8a	Wide dispersive use	Direct handling	Extensive	No	0.5	6.8571	0.3	4.1143	0.1	1.3714	0.05	0.6857	960
				Yes	0.05	0.6857	0.03	0.4114	0.01	0.1371	0.005	0.0686	
8b	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480
9	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480
10	Wide dispersive use	Direct handling	Extensive	No	0.5	1.7143	0.3	1.0286	0.1	0.3429	0.05	0.1714	240
				Yes	0.05	0.1714	0.03	0.1029	0.01	0.0343	0.005	0.0171	
12	Non-dispersive use	Direct handling	Intermittent	No	0.005	0.0343	0.003	0.0206	0.001	0.0069	0.0005	0.0034	480
13	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480
15	Non-dispersive use	Direct handling	Incidental	No	0.005	0.0171	0.003	0.0103	0.001	0.0034	0.0005	0.0017	240

4.2 Environmental exposure

Aquatic environment

Negligible emissions of iron into the aquatic environment are anticipated with the identified uses of iron salt products.

Terrestrial environment

Iron directly introduced into the terrestrial environment as a result of the use of iron salt products will not significantly alter the generally high natural background concentrations of this metal.

Atmospheric environment

The iron salts have very low vapour pressures. No significant formation of aerosols or dusts containing iron salts is anticipated with the identified uses of iron salt products.

EXPOSURE SCENARIO # 5 OF CHEMICAL SAFETY REPORT

1. Short title of the exposure scenario		
Professional application of powdery solid iron salt products that may lead to significant dust formation		
2. Processes and activities covered by the exposure scenario		
The ES describes the professional use of iron(II) sulphate (FeSO4, ferrous sulphate) which may be supplied as solids in various hydration states. The solid substances or solid mixtures containing them may be transferred in enclosed or open dedicated or non-dedicated systems in large or small amounts, be blended and mixed with other substances in enclosed or open vessels and be used for different purposes in closed or open continuous or batch processes. The ES is applicable to the professional use of cements, professional use as laboratory agent, professional use in sealants and coatings, professional use in land remediation applications, in use in agrochemicals and in other uses associated with similar occupational professional activities.		
Sector of Use (SU)	SU 1	Agriculture, forestry, fishery
	SU 10	Formulation
	SU 13	Manufacture of non-metallic mineral products (plasters, cement)
	SU 19	Building and construction work
	SU 24	Scientific research and development
Product Category (PC)	Not applicable	
Process Category (PROC)	PROC 1	Closed process without breaching
	PROC 2	Use in closed, continuous processes with controlled exposure
	PROC 3	Use in closed batch process
	PROC 4	Use in batch and other processes with possibility of significant exposure
	PROC 5	Mixing and blending in batch processes
	PROC 8a	Transfer at non-dedicated facilities
	PROC 8b	Transfer at dedicated facilities
	PROC 9	Transfer into small containers
	PROC 14	Production of preparations and articles by tableting, compression, extrusion, pelletisation
	PROC 15	Use as laboratory agent
	PROC 22	Potentially closed processing operations with minerals and metals at elevated temperature
	PROC 26	Handling of solid inorganic substances at ambient temperature
Article Category (AC)	AC 01	Adhesive, sealant and coating
	AC 4	Stone, plaster, cement, glass and ceramic articles
Environment Release Category (ERC)	ERC 8a	Wide dispersive indoor use of processing aids in open systems
	ERC 8c	Wide dispersive indoor use resulting in inclusion into or onto a matrix
	ERC 8d	Wide dispersive outdoor use of processing aids in open systems
	ERC 8e	Wide dispersive outdoor use of reactive substances in open systems
	ERC 8f	Wide dispersive outdoor use resulting in inclusion into or onto a matrix
3. Operational conditions and risk management measures		
Product characteristics	Solid powdery iron salt products that are transferred, re-packaged, bagged, delivered to and handled by professional downstream users.	
Used amount of substance	It may range from a few grams to dozens of kilograms per day. In the assessment of environmental exposure, a typical use amount of 25 g iron per m³ waste water and a reasonable highest use amount of 250 g iron per m³ waste water were considered.	
3.1 Controlling environmental exposure		
Frequency and duration of use	The majority of processes are running on less than 300 days per year. Professional uses are batch processes in the majority of cases.	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Equipment with dust abatement techniques to avoid atmospheric emissions, for example bag filters. The waste water produced in the processes and containing dissolved iron salts as well as heavy metal impurities is collected and treated, for example by means of precipitation, before released to further waste water treatment or the environment.	
Conditions and measures related to industrial waste water treatment (onsite or	The volume of waste water emitted per day is 2000 m³ for the majority of processes (the standard condition in EUSES). The volumetric waste water flow can be changed by using the appropriate equation for scaling of the risk	

external)	characterisation ratios.
Conditions and measures related to external recovery of waste	Waste water produced at the sites is treated by precipitation to remove iron and heavy metal impurities. The resulting solids are disposed of mainly in landfills according to local environmental regulations

3.2 Controlling worker exposure

Frequency and duration of use	Daily exposure occurring during a full working shift of 8 hours. A worker may be exposed on 220 days per year under normal conditions.
Human factors not influenced by risk management	The worker under normal conditions has a breathing rate of 10 m ³ per 8 hour shift. The exposed skin area per activity was used as defined in the MEASE exposure assessment tool.
Technical conditions and measures to control dispersion from source towards the worker	The facilities where solid iron salt products are directly handled by workers should be equipped with efficient local exhaust ventilation systems.
Conditions and measures related to personal protection, hygiene and health evaluation	In the absence of local exhaust ventilation workers directly handling solid iron salt products should wear respiratory mask with appropriate dust filters. Workers directly handling solid iron salt products should wear chemical resistant gloves and safety goggles as well as appropriate working clothes and boots.

3.3 Controlling consumer exposure

No consumer exposure is anticipated with the professional activities described in this exposure scenario.

3.4 Controlling exposure during the service life of articles

Since the iron salts will be bound into the solid matrix of articles, no release of iron salts from articles during the service life is anticipated under reasonable use conditions.

4. Exposure estimation

4.1 Worker exposure

Exposure estimates calculated with the MEASE modelling tool.

Acute exposure

Estimated acute inhalation exposure of professional workers to powdery solid iron salt products

Process category	LEV	Mask	Inhalation exposure in mg/m ³ taking RMMs into account (based on product containing >25 % iron salt)
PROC 2	No	No	10.00
PROC 3	No	No	10.00
PROC 4	80 %	No	10.00
PROC 5	80 %	No	10.00
PROC 8a	80 %	No	10.00
PROC 8b	80 %	No	10.00
PROC 9	80 %	No	4.00
PROC 14	80 %	No	10.00
PROC 15	No	No	10.00

Long-term exposure

Occupational long-term inhalation exposure to iron salts resulting from professional use of products

Process category	Duration in minutes	LEV	Respiratory mask	Predicted exposure to pure iron salt; no RMMs [mg/m ³]	Inhalation exposure in mg/m ³ taking RMMs into account (based on product containing >25 % iron salt)
PROC 2	> 240	80 %	No	5	1.00
PROC 3	> 240	80 %	No	5	1.00
PROC 4	> 240	80 %	90 %	50	1.00
PROC 5	> 240	80 %	90 %	50	1.00
PROC 8 a	> 240	80 %	90 %	50	1.00
PROC 8 b	> 240	80 %	90 %	50	1.00
PROC 9	> 240	80 %	No	20	4.00
PROC 14	> 240	80 %	90 %	50	1.00
PROC 15	> 240	80 %	No	5	1.00
PROC 19	> 240	80 %	90 %	50	1.00

Occupational dermal exposure to iron salts resulting from professional use of products (independent of particle size of products)

Pattern of control	Dermal load in mg/cm ² ; Dermal dose in mg/kg bw/day (for 70 kg)
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	Pattern of use	Exposure control	Contact level	Use of gloves	C > 25 %		C = 5 to 25 %		C = 1 to 5 %		C = < 1 %		Exposed skin area in cm ²
					Load	Dose	Load	Dose	Load	Dose	Load	Dose	
2	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480
3	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0017	0.0003	0.0011	0.0001	0.0004	0.00005	0.0002	240
4	Wide dispersive use	Direct handling	Extensive	No	0.5	3.4286	0.3	2.0571	0.1	0.6857	0.05	0.3429	480
5	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480
8a	Wide dispersive use	Direct handling	Extensive	No	0.5	6.8571	0.3	4.1143	0.1	1.3714	0.05	0.6857	960
				Yes	0.05	0.6857	0.03	0.4114	0.01	0.1371	0.005	0.0686	
8b	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480
9	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480
14	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480
15	Non-dispersive use	Direct handling	Incidental	No	0.005	0.0171	0.003	0.0103	0.001	0.0034	0.0005	0.0017	240
26	Non-dispersive use	Direct handling	Incidental	No	0.5	14.143	0.3	8.4857	0.1	2.8286	0.05	1.4143	1980
				Yes	0.05	1.4143	0.03	0.8486	0.01	0.2829	0.005	0.1414	

4.2 Environmental exposure

Aquatic environment

Negligible emissions of iron into the aquatic environment are anticipated with the identified uses of iron salt products.

Terrestrial environment

Iron directly introduced into the terrestrial environment as a result of the use of iron salt products will not significantly alter the generally high natural background concentrations of this metal.

Atmospheric environment

The iron salts have very low vapour pressures. No significant formation of aerosols or dusts containing iron salts is anticipated with the identified uses of iron salt products.

EXPOSURE SCENARIO # 6 OF CHEMICAL SAFETY REPORT

1. Short title of the exposure scenario		
Professional application of granular solid iron salt products that may lead to moderate dust formation		
2. Processes and activities covered by the exposure scenario		
<p>The ES describes the professional use of iron(II) sulphate (FeSO₄, ferrous sulphate) which may be supplied as solids in various hydration states.</p> <p>The solid substances or solid mixtures containing them may be transferred in enclosed or open dedicated or non-dedicated systems in large or small amounts, be blended and mixed with other substances in enclosed or open vessels and be used for different purposes in closed or open continuous or batch processes.</p> <p>The ES is applicable to the professional use of cements, professional use as laboratory agent, professional use in sealants and coatings, professional use in land remediation applications, in use in agrochemicals and in other uses associated with similar occupational professional activities.</p>		
Sector of Use (SU)	SU 1	Agriculture, forestry, fishery
	SU 10	Formulation
	SU 13	Manufacture of non-metallic mineral products (plasters, cement)
	SU 19	Building and construction work
	SU 24	Scientific research and development
Product Category (PC)	Not applicable	
Process Category (PROC)	PROC 1	Closed process without breaching
	PROC 2	Use in closed, continuous processes with controlled exposure
	PROC 3	Use in closed batch process
	PROC 4	Use in batch and other processes with possibility of significant exposure
	PROC 5	Mixing and blending in batch processes
	PROC 8a	Transfer at non-dedicated facilities
	PROC 8b	Transfer at dedicated facilities
	PROC 9	Transfer into small containers
	PROC 15	Use as laboratory agent
	PROC 26	Handling of solid inorganic substances at ambient temperature
Article Category (AC)	AC 01	Adhesive, sealant and coating
	AC 4	Stone, plaster, cement, glass and ceramic articles
Environment Release Category (ERC)	ERC 8a	Wide dispersive indoor use of processing aids in open systems
	ERC 8c	Wide dispersive indoor use resulting in inclusion into or onto a matrix
	ERC 8d	Wide dispersive outdoor use of processing aids in open systems
	ERC 8e	Wide dispersive outdoor use of reactive substances in open systems
	ERC 8f	Wide dispersive outdoor use resulting in inclusion into or onto a matrix
3. Operational conditions and risk management measures		
Product characteristics	Solid granular iron salt products that are transferred, re-packaged, bagged, delivered to and handled by professional downstream users.	
Used amount of substance	It may range from a few grams to dozens of kilograms per day. In the assessment of environmental exposure, a typical use amount of 25 g iron per m ³ waste water and a reasonable highest use amount of 250 g iron per m ³ waste water were considered.	
3.1 Controlling environmental exposure		
Frequency and duration of use	The majority of processes are running on less than 300 days per year. Professional uses are batch processes in the majority of cases.	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Equipment with dust abatement techniques to avoid atmospheric emissions, for example bag filters. The waste water produced in the processes and containing dissolved iron salts as well as heavy metal impurities is collected and treated, for example by means of precipitation, before released to further waste water treatment or the environment.	
Conditions and measures related to industrial waste water treatment (onsite or external)	The volume of waste water emitted per day is 2000 m ³ for the majority of processes (the standard condition in EUSES). The volumetric waste water flow can be changed by using the appropriate equation for scaling of the risk characterisation ratios.	
Conditions and measures related to external recovery of waste	Waste water produced at the sites is treated by precipitation to remove iron and heavy metal impurities. The resulting solids are disposed of mainly in landfills according to local environmental regulations.	

3.2 Controlling worker exposure													
Frequency and duration of use	Daily exposure occurring during a full working shift of 8 hours. A worker may be exposed on 220 days per year under normal conditions.												
Human factors not influenced by risk management	The worker under normal conditions has a breathing rate of 10 m³ per 8 hour shift. The exposed skin area per activity was used as defined in the MEASE exposure assessment tool.												
Technical conditions and measures to control dispersion from source towards the worker	The facilities where solid iron salt products are directly handled by workers should be equipped with efficient local exhaust ventilation systems.												
Conditions and measures related to personal protection, hygiene and health evaluation	In the absence of local exhaust ventilation workers directly handling solid iron salt products should wear respiratory mask with appropriate dust filters. Workers directly handling solid iron salt products should wear chemical resistant gloves and safety goggles as well as appropriate working clothes and boots.												
3.3 Controlling consumer exposure													
No consumer exposure is anticipated with the professional activities described in this exposure scenario.													
3.4 Controlling exposure during the service life of articles													
Since the iron salts will be bound into the solid matrix of articles, no release of iron salts from articles during the service life is anticipated under reasonable use conditions.													
4. Exposure estimation													
4.1 Worker exposure													
Exposure estimates calculated with the MEASE modelling tool.													
Acute exposure													
Estimated acute inhalation exposure of industrial workers to powdery solid iron salt products													
Process category	LEV	Mask	Inhalation exposure in mg/m³ taking RMMs into account (based on product containing >25 % iron salt)										
PROC 2	No	No	10.00										
PROC 3	No	No	10.00										
PROC 4	80 %	No	10.00										
PROC 5	80 %	No	10.00										
PROC 8a	80 %	No	10.00										
PROC 8b	80 %	No	10.00										
PROC 9	80 %	No	4.00										
PROC 15	No	No	10.00										
Long-term exposure													
Occupational long-term inhalation exposure to iron salts resulting from professional use of products													
Process category	Duration in minutes	LEV	Respiratory mask	Predicted exposure to pure iron salt; no RMMs [mg/m³]	Inhalation exposure in mg/m³ taking RMMs into account (based on product containing >25 % iron salt)								
PROC 2	> 240	No	No	1	1.00								
PROC 3	> 240	No	No	1	1.00								
PROC 4	> 240	Yes	No	5	1.00								
PROC 5	> 240	Yes	No	5	1.00								
PROC 8a	> 240	Yes	No	5	1.00								
PROC 8b	> 240	Yes	No	5	1.00								
PROC 9	> 240	Yes	No	5	1.00								
PROC 15	> 240	No	No	0.5	0.50								
PROC 26	> 240	Yes	No	8	1.84								
Occupational dermal exposure to iron salts resulting from professional use of products (independent of particle size of products)													
PROC	Pattern of control				Dermal load in mg/cm²; Dermal dose in mg/kg bw/day (for 70 kg)								
	Pattern of use	Exposure control	Contact level	Use of gloves	C > 25 %		C = 5 to 25 %		C = 1 to 5 %		C = < 1 %		Exposed skin area in cm²
					Load	Dose	Load	Dose	Load	Dose	Load	Dose	
2	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480
3	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0017	0.0003	0.0011	0.0001	0.0004	0.00005	0.0002	240

4	Wide dispersive use	Direct handling	Extensive	No	0.5	3.4286	0.3	2.0571	0.1	0.6857	0.05	0.3429	480
5	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480
8a	Wide dispersive use	Direct handling	Extensive	No	0.5	6.8571	0.3	4.1143	0.1	1.3714	0.05	0.6857	960
				Yes	0.05	0.6857	0.03	0.4114	0.01	0.1371	0.005	0.0686	
8b	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480
9	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480
15	Non-dispersive use	Direct handling	Incidental	No	0.005	0.0171	0.003	0.0103	0.001	0.0034	0.0005	0.0017	240
26	Non-dispersive use	Direct handling	Incidental	No	0.5	14.143	0.3	8.4857	0.1	2.8286	0.05	1.4143	1980
				Yes	0.05	1.4143	0.03	0.8486	0.01	0.2829	0.005	0.1414	

4.2 Environmental exposure

Aquatic environment

Negligible emissions of iron into the aquatic environment are anticipated with the identified uses of iron salt products.

Terrestrial environment

Iron directly introduced into the terrestrial environment as a result of the use of iron salt products will not significantly alter the generally high natural background concentrations of this metal.

Atmospheric environment

The iron salts have very low vapour pressures. No significant formation of aerosols or dusts containing iron salts is anticipated with the identified uses of iron salt products.

EXPOSURE SCENARIO # 7 OF CHEMICAL SAFETY REPORT

1. Short title of the exposure scenario		
Professional application of coarse solid iron salt products that may lead to low dust formation		
2. Processes and activities covered by the exposure scenario		
The ES describes the professional use of iron(II) sulphate (FeSO4, ferrous sulphate) which may be supplied as solids in various hydration states. The solid substances or solid mixtures containing them may be transferred in enclosed or open dedicated or non-dedicated systems in large or small amounts, be blended and mixed with other substances in enclosed or open vessels and be used for different purposes in closed or open continuous or batch processes. The ES is applicable to the professional use of cements, professional use as laboratory agent, professional use in sealants and coatings, professional use in land remediation applications, in use in agrochemicals and in other uses associated with similar occupational professional activities.		
Sector of Use (SU)	SU 1	Agriculture, forestry, fishery
	SU 13	Manufacture of non-metallic mineral products (plasters, cement)
	SU 19	Building and construction work
	SU 24	Scientific research and development
Product Category (PC)	Not applicable	
Process Category (PROC)	PROC 1	Closed process without breaching
	PROC 2	Use in closed, continuous processes with controlled exposure
	PROC 5	Mixing and blending in batch processes
	PROC 8a	Transfer at non-dedicated facilities
	PROC 8b	Transfer at dedicated facilities
	PROC 9	Transfer into small containers
	PROC 10	Roller application or brushing
	PROC 15	Use as laboratory agent
PROC 26	Handling of solid inorganic substances at ambient temperature	
Article Category (AC)	AC 01	Adhesive, sealant and coating
	AC 4	Stone, plaster, cement, glass and ceramic articles
Environment Release Category (ERC)	ERC 8a	Wide dispersive indoor use of processing aids in open systems
	ERC 8c	Wide dispersive indoor use resulting in inclusion into or onto a matrix
	ERC 8d	Wide dispersive outdoor use of processing aids in open systems
	ERC 8e	Wide dispersive outdoor use of reactive substances in open systems
	ERC 8f	Wide dispersive outdoor use resulting in inclusion into or onto a matrix
3. Operational conditions and risk management measures		
Product characteristics	Solid coarse iron salt products that are transferred, re-packaged, bagged, delivered to and handled by professional downstream users.	
Used amount of substance	It may range from a few grams to dozens of kilograms per day. In the assessment of environmental exposure, a typical use amount of 25 g iron per m³ waste water and a reasonable highest use amount of 250 g iron per m³ waste water were considered.	
3.1 Controlling environmental exposure		
Frequency and duration of use	The majority of processes are running on less than 300 days per year. Professional uses are batch processes in the majority of cases.	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	Equipment with dust abatement techniques to avoid atmospheric emissions, for example bag filters. The waste water produced in the processes and containing dissolved iron salts as well as heavy metal impurities is collected and treated, for example by means of precipitation, before released to further waste water treatment or the environment.	
Conditions and measures related to industrial waste water treatment (onsite or external)	The volume of waste water emitted per day is 2000 m³ for the majority of processes (the standard condition in EUSES). The volumetric waste water flow can be changed by using the appropriate equation for scaling of the risk characterisation ratios.	
Conditions and measures related to external recovery of waste	Waste water produced at the sites is treated by precipitation to remove iron and heavy metal impurities. The resulting solids are disposed of mainly in landfills according to local environmental regulations.	
3.2 Controlling worker exposure		
Frequency and duration of use	Daily exposure occurring during a full working shift of 8 hours. A worker may be exposed on 220 days per year under normal conditions.	

Human factors not influenced by risk management	The worker under normal conditions has a breathing rate of 10 m ³ per 8 hour shift. The exposed skin area per activity was used as defined in the MEASE exposure assessment tool.
Technical conditions and measures to control dispersion from source towards the worker	The facilities where solid iron salt products are directly handled by workers should be equipped with efficient local exhaust ventilation systems.
Conditions and measures related to personal protection, hygiene and health evaluation	In the absence of local exhaust ventilation workers directly handling solid iron salt products should wear respiratory mask with appropriate dust filters. Workers directly handling solid iron salt products should wear chemical resistant gloves and safety goggles as well as appropriate working clothes and boots.

3.3 Controlling consumer exposure

No consumer exposure is anticipated with the professional activities described in this exposure scenario.

3.4 Controlling exposure during the service life of articles

Since the iron salts will be bound into the solid matrix of articles, no release of iron salts from articles during the service life is anticipated under reasonable use conditions.

4. Exposure estimation

4.1 Worker exposure

Exposure estimates calculated with the MEASE modelling tool.

Acute exposure

Estimated acute inhalation exposure of professional workers to solid iron salt products

Process category	LEV	Mask	Inhalation exposure in mg/m ³ taking RMMs into account (based on product containing >25 % iron salt)
PROC 2	No	No	10.00
PROC 5	80 %	No	10.00
PROC 8a	80 %	No	10.00
PROC 8b	80 %	No	10.00
PROC 9	80 %	No	4.00
PROC 10	No	No	0.10
PROC 15	No	No	10.00

Long-term exposure

Occupational long-term inhalation exposure to iron salts resulting from professional use of solid products

Process category	Duration in minutes	LEV	Respiratory mask	Predicted exposure to pure iron salt; no RMMs [mg/m ³]	Inhalation exposure in mg/m ³ taking RMMs into account (based on product containing >25 % iron salt)
PROC 2	> 240	No	No	0.01	0.01
PROC 5	> 240	No	No	1	1.00
PROC 8a	> 240	No	No	0.5	0.50
PROC 8b	> 240	No	No	0.5	0.50
PROC 9	> 240	No	No	0.5	0.50
PROC 15	> 240	No	No	0.1	0.10
PROC 26	> 240	No	No	3	3.00

Occupational dermal exposure to iron salts resulting from professional use of products (independent of particle size of products)

PROC	Pattern of control				Dermal load in mg/cm ² ; Dermal dose in mg/kg bw/day (for 70 kg)								
	Patter n of use	Expos ure control	Contac t level	Use of gloves	C > 25 %		C = 5 to 25 %		C = 1 to 5 %		C = < 1 %		Exposed skin area in cm ²
					Load	Dose	Load	Dose	Load	Dose	Load	Dose	
2	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000 3	0.002 1	0.000 1	0.000 7	0.00005	0.000 3	480
5	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000 3	0.002 1	0.000 1	0.000 7	0.00005	0.000 3	480
8a	Wide dispersive use	Direct handling	Extens ive	No	0.5	6.857 1	0.3	4.114 3	0.1	1.371 4	0.05	0.685 7	960

				Yes	0.05	0.685 7	0.03	0.411 4	0.01	0.137 1	0.005	0.068 6	
8b	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480
9	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480
10	Wide dispersive use	Direct handling	Extensive	No	0.5	3.4286	0.3	2.0571	0.1	0.6857	0.05	0.3429	480
				Yes	0.05	0.3429	0.03	0.2057	0.01	0.0686	0.005	0.0343	
15	Non-dispersive use	Direct handling	Incidental	No	0.005	0.0171	0.003	0.0103	0.001	0.0034	0.0005	0.0017	240
26	Non-dispersive use	Direct handling	Incidental	No	0.5	14.143	0.3	8.4857	0.1	2.8286	0.05	1.4143	1980
				Yes	0.05	1.4143	0.03	0.8486	0.01	0.2829	0.005	0.1414	

4.2 Environmental exposure

Aquatic environment

Negligible emissions of iron into the aquatic environment are anticipated with the identified uses of iron salt products.

Terrestrial environment

Iron directly introduced into the terrestrial environment as a result of the use of iron salt products will not significantly alter the generally high natural background concentrations of this metal.

Atmospheric environment

The iron salts have very low vapour pressures. No significant formation of aerosols or dusts containing iron salts is anticipated with the identified uses of iron salt products.

EXPOSURE SCENARIO # 8 OF CHEMICAL SAFETY REPORT

1. Short title of the exposure scenario		
Professional application of liquid iron salt products		
2. Processes and activities covered by the exposure scenario		
The ES describes the professional use of iron(II) sulphate (FeSO ₄ , ferrous sulphate) which may be supplied as aqueous solutions of varying concentrations. The liquid mixtures containing them may be transferred in enclosed or open dedicated or non-dedicated systems in large or small amounts, be blended and mixed with other substances in enclosed or open vessels and be used for different purposes in closed or open continuous or batch processes. The ES is applicable to the professional use of cements, professional use as laboratory agent, professional use in sealants and coatings, professional use in land remediation applications, in use in agrochemicals and in other uses associated with similar occupational professional activities.		
Sector of Use (SU)	SU 1	Agriculture, forestry, fishery
	SU 13	Manufacture of non-metallic mineral products (plasters, cement)
	SU 19	Building and construction work
	SU 24	Scientific research and development
Product Category (PC)	Not applicable	
Process Category (PROC)	PROC 1	Closed process without breaching
	PROC 2	Use in closed, continuous processes with controlled exposure
	PROC 5	Mixing and blending in batch processes
	PROC 8a	Transfer at non-dedicated facilities
	PROC 8b	Transfer at dedicated facilities
	PROC 9	Transfer into small containers
	PROC 10	Roller application or brushing
	PROC 11	Non-industrial spraying
	PROC 13	Treatment of articles by dipping and pouring
	PROC 15	Use as laboratory agent
	PROC 19	Hand-mixing with intimate contact and only personal protective equipment available
Article Category (AC)	AC 01	Adhesive, sealant and coating
	AC 4	Stone, plaster, cement, glass and ceramic articles
Environment Release Category (ERC)	ERC 8a	Wide dispersive indoor use of processing aids in open systems
	ERC 8c	Wide dispersive indoor use resulting in inclusion into or onto a matrix
	ERC 8d	Wide dispersive outdoor use of processing aids in open systems
	ERC 8e	Wide dispersive outdoor use of reactive substances in open systems
	ERC 8f	Wide dispersive outdoor use resulting in inclusion into or onto a matrix
3. Operational conditions and risk management measures		
Product characteristics	Liquid mixtures containing iron salts that are transferred, re-packaged, bagged, delivered to and handled by professional downstream users.	
Used amount of substance	It may range from a few grams to dozens of kilograms per day. In the assessment of environmental exposure, a typical use amount of 25 g iron per m ³ waste water and a reasonable highest use amount of 250 g iron per m ³ waste water were considered.	
3.1 Controlling environmental exposure		
Frequency and duration of use	The majority of processes are running on less than 300 days per year. Professional uses are batch processes in the majority of cases.	
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil	The waste water produced in the processes and containing dissolved iron salts as well as heavy metal impurities is collected and treated, for example by means of precipitation, before released to further waste water treatment or the environment.	
Conditions and measures related to industrial waste water treatment (onsite or external)	The volume of waste water emitted per day is 2000 m ³ for the majority of processes (the standard condition in EUSES). The volumetric waste water flow can be changed by using the appropriate equation for scaling of the risk characterisation ratios.	
Conditions and measures related to external recovery of waste	Waste water produced at the sites is treated by precipitation to remove iron and heavy metal impurities. The resulting solids are disposed of mainly in landfills according to local environmental regulations.	
3.2 Controlling worker exposure		

Frequency and duration of use	Daily exposure occurring during a full working shift of 8 hours. A worker may be exposed on 220 days per year under normal conditions.
Human factors not influenced by risk management	The worker under normal conditions has a breathing rate of 10 m ³ per 8 hour shift. The exposed skin area per activity was used as defined in the MEASE exposure assessment tool.
Technical conditions and measures to control dispersion from source towards the worker	The facilities where liquid mixtures are sprayed or vigorously mixed by workers should be equipped with efficient local exhaust ventilation systems.
Conditions and measures related to personal protection, hygiene and health evaluation	In the absence of local exhaust ventilation workers directly handling liquid mixtures containing iron salts should wear respiratory mask with appropriate filters. Workers directly handling solid iron salt products should wear chemical resistant gloves and safety goggles as well as appropriate working clothes and boots.

3.3 Controlling consumer exposure

No consumer exposure is anticipated with the professional activities described in this exposure scenario.

3.4 Controlling exposure during the service life of articles

Since the iron salts will be bound into the solid matrix of articles, no release of iron salts from articles during the service life is anticipated under reasonable use conditions.

4. Exposure estimation

4.1 Worker exposure

Exposure estimates calculated with the MEASE modelling tool.

Acute exposure

Estimated acute inhalation exposure of industrial workers to iron salt products

Process category	LEV	Mask	Inhalation exposure in mg/m ³ taking RMMs into account (based on product containing >25 % iron salt)
PROC 2	No	No	10.00
PROC 5	80 %	No	10.00
PROC 8a	80 %	No	10.00
PROC 8b	80 %	No	10.00
PROC 9	80 %	No	4.00
PROC 10	No	No	0.10
PROC 11	80 %	No	4.00
PROC 13	No	No	0.10
PROC 15	No	No	10.00
PROC 19	80 %	No	10.00

Long-term exposure

Occupational long-term inhalation exposure to iron salts resulting from professional use of products

Process category	Duration in minutes	LEV	Respiratory mask	Predicted exposure to pure iron salt; no RMMs [mg/m ³]	Inhalation exposure in mg/m ³ taking RMMs into account (based on product containing >25 % iron salt)
PROC 2	> 240	No	No	0.001	0.001
PROC 5	> 240	No	No	0.1	0.100
PROC 8a	> 240	No	No	0.05	0.050
PROC 8b	> 240	No	No	0.05	0.050
PROC 9	> 240	No	No	0.05	0.050
PROC 10	> 240	No	No	0.05	0.050
PROC 11	> 240	80 %	90 %	20	0.400
PROC 13	> 240	No	No	0.05	0.050
PROC 15	> 240	No	No	0.01	0.010
PROC 19	> 240	No	No	0.05	0.050

Occupational dermal exposure to iron salts resulting from professional use of products

PROC	Pattern of control				Dermal load in mg/cm ² ; Dermal dose in mg/kg bw/day (for 70 kg)								
	Patter n of use	Expos ure control	Contac t level	Use of gloves	C > 25 %		C = 5 to 25 %		C = 1 to 5 %		C = < 1 %		Exposed skin area in cm ²
					Load	Dose	Load	Dose	Load	Dose	Load	Dose	
2	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000 3	0.002 1	0.000 1	0.000 7	0.00005	0.000 3	480

3	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0017	0.0003	0.0011	0.0001	0.0004	0.00005	0.0002	240
4	Wide dispersive use	Direct handling	Extensive	No	0.5	3.4286	0.3	2.0571	0.1	0.6857	0.05	0.3429	480
5	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480
8a	Wide dispersive use	Direct handling	Extensive	No	0.5	6.8571	0.3	4.1143	0.1	1.3714	0.05	0.6857	960
				Yes	0.05	0.6857	0.03	0.4114	0.01	0.1371	0.005	0.0686	
8b	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480
9	Non-dispersive use	Non-direct handling	Incidental	No	0.0005	0.0034	0.0003	0.0021	0.0001	0.0007	0.00005	0.0003	480
10	Wide dispersive use	Direct handling	Extensive	No	0.5	3.4286	0.3	2.0571	0.1	0.6857	0.05	0.3429	480
				Yes	0.05	0.3429	0.03	0.2057	0.01	0.0686	0.005	0.0343	
11	Wide dispersive use	Direct handling	Extensive	No	0.5	3.4286	0.3	2.0571	0.1	0.6857	0.05	0.3429	480
				Yes	0.05	0.3429	0.03	0.2057	0.01	0.0686	0.005	0.0343	
13	Non-dispersive use	Direct handling	Intermittent	No	0.005	0.0343	0.003	0.0206	0.001	0.0069	0.0005	0.0034	480
15	Non-dispersive use	Direct handling	Incidental	No	0.005	0.0171	0.003	0.0103	0.001	0.0034	0.0005	0.0017	240
19	Non-dispersive use	Direct handling	Extensive	No	0.5	14.143	0.3	8.4857	0.1	2.8286	0.05	1.4143	1980
				Yes	0.05	1.4143	0.03	0.8486	0.01	0.2829	0.005	0.1414	

4.2 Environmental exposure

Aquatic environment

Negligible emissions of iron into the aquatic environment are anticipated with the identified uses of iron salt products.

Terrestrial environment

Iron directly introduced into the terrestrial environment as a result of the use of iron salt products will not significantly alter the generally high natural background concentrations of this metal.

Atmospheric environment

The iron salts have very low vapour pressures. No significant formation of aerosols or dusts containing iron salts is anticipated with the identified uses of iron salt products.

EXPOSURE SCENARIO # 9 OF CHEMICAL SAFETY REPORT

1. Short title of the exposure scenario		
Consumer applications of solid iron salt products that may lead to dust formation		
2. Processes and activities covered by the exposure scenario		
<p>The ES describes the consumer use of retail products containing iron(II) sulphate (FeSO₄, ferrous sulphate) which may be supplied as solids in various hydration states.</p> <p>The solid products may be used as such or blended with other mineral components prior to use. They may be wetted or dissolved in water. Solid products used by consumers may be transferred, blended, dissolved or distributed by hand.</p> <p>The ES is applicable to the use in cements, in etching metals, use in agrochemicals and also in other uses associated with similar consumer activities.</p>		
Sector of Use (SU)	Not applicable	
Product Category (PC)	PC 1	Adhesives, sealants
	PC 9b	Fillers, putties, plasters, modelling clay
	PC 12	Fertilisers
	PC 14	Metal surface treatment products, including galvanic and electroplating products
	PC 27	Plant protection products
Process Category (PROC)	Not applicable	
Article Category (AC)	AC 01	Adhesive, sealant and coating
	AC 4	Stone, plaster, cement, glass and ceramic articles
Environment Release Category (ERC)	ERC 8a	Wide dispersive indoor use of processing aids in open systems
	ERC 8c	Wide dispersive indoor use resulting in inclusion into or onto a matrix
	ERC 8d	Wide dispersive outdoor use of processing aids in open systems
	ERC 8f	Wide dispersive outdoor use resulting in inclusion into or onto a matrix
3. Operational conditions and risk management measures		
Product characteristics	Solid products containing iron salts may be available as powders or granules which are distributed in bags containing 1 to 50 kg. The concentration of iron salts in cements is around 0.5 % w/w. The concentration of ferrous sulphate in solid fertiliser or agrochemical products is variable but can be as high as about 80 % w/w.	
Used amount of substance	Private users may use up to dozens of kilograms of solid products on a single event depending on the type of product and the purpose of its use. Maximum emissions of a few kilograms iron salts per event are anticipated. A reasonable application rate for iron salt fertilisers and agrochemicals is 20 g/m ² .	
3.1 Controlling environmental exposure		
Frequency and duration of use	Low for the individual consumer, but daily use is considered for the assessment of environmental concentrations.	
Other given operational conditions affecting environmental exposure	Solid products containing iron salts can be used indoors and outdoors and may be directly applied to the soil, such as in the case of fertilisers and agrochemical products.	
Conditions and measures related to municipal sewage treatment plant	Some uses of iron salts will lead to direct release of substance to the environment. The municipal sewage treatment plant considered in the modelling of environmental concentrations by default has a daily capacity of 2000 m ³ for those uses leading to release to the public sewerage system.	
Condition and measures related to external treatment of waste for disposal	Small amounts of product may remain in the packages which are disposed of via regular household waste. Solid wastes from private use are expected to be incinerated or disposed of in landfills in accordance with local environmental regulations.	
3.2 Controlling worker exposure		
No worker exposure is anticipated with the consumer use of iron salt products.		
3.3 Controlling consumer exposure		
Frequency and duration of use	The frequency of use of products containing iron salts by individual consumers probably is low.	
Human factors not influenced by risk management	A consumer has a breathing rate of 20 m ³ /day and a body weight of 60 kg by default.	

Other given operational conditions affecting consumer exposure	Products may be used indoors or outdoors. It is recommended that the products are used in well ventilated areas only.
Conditions and measures related to information and behavioural advice to consumers	Dusty products should be used in well ventilated areas e.g. in the presence of open doors and windows.
Conditions and measures related to personal protection and hygiene	Usually it is not anticipated that consumers apply personal protection equipment. It is recommended that consumers handling solid products containing iron salts should use gloves and glasses. The use of dust masks is recommended in the case of use of powdery products in confined areas.

3.4 Controlling exposure during the service life of articles

Since the iron salts will be bound into the solid matrix of articles, no release of iron salts from articles during the service life is anticipated under reasonable use conditions.

4. Exposure estimation

4.1 Consumer exposure

Product type (iron salt content)	Scenario and conditions of use	Model	Inhalation exposure [mg/m ³]		Dermal dose [mg/kg bw/day]
			Acute	Long-term	
Non-dusty fertilisers (80 % w/w)	Manual distribution of granules/flakes, 2 kg on 100 m ² , 30 minutes	UK POEM	0.24	0.005	4.57
Dusty cements (0.5 % w/w)	Emptying of paper bags into mixer, 500 kg, 1 hour	UK POEM	0.63	0.027	0.57

4.2 Environmental exposure

Aquatic environment

Negligible emissions of iron into the aquatic environment are anticipated with the identified uses of iron salt products.

Terrestrial environment

Iron directly introduced into the terrestrial environment as a result of the use of iron salt products will not significantly alter the generally high natural background concentrations of this metal.

Atmospheric environment

The iron salts have very low vapour pressures. No significant formation of aerosols or dusts containing iron salts is anticipated with the identified uses of iron salt products.

EXPOSURE SCENARIO # 10 OF CHEMICAL SAFETY REPORT

1. Short title of the exposure scenario		
Consumer applications of iron salt products involving the use of aqueous solutions and liquid mixtures		
2. Processes and activities covered by the exposure scenario		
The ES describes the consumer use of retail products containing iron(II) sulphate (FeSO ₄ , ferrous sulphate) which may be supplied as aqueous solutions of varying concentration. The liquid products used by consumers may be used as such or in diluted aqueous form and may be poured, mixed, spread on surfaces, brushed or sprayed. The ES is applicable to the use in cements, in etching metals, use in agrochemicals and also in other uses associated with similar consumer activities.		
Sector of Use (SU)	Not applicable	
Product Category (PC)	PC 1	Adhesives, sealants
	PC 9b	Fillers, putties, plasters, modelling clay
	PC 12	Fertilisers
	PC 14	Metal surface treatment products, including galvanic and electroplating products
	PC 27	Plant protection products
Process Category (PROC)	Not applicable	
Article Category (AC)	AC 01	Adhesive, sealant and coating
	AC 4	Stone, plaster, cement, glass and ceramic articles
Environment Release Category (ERC)	ERC 8a	Wide dispersive indoor use of processing aids in open systems
	ERC 8c	Wide dispersive indoor use resulting in inclusion into or onto a matrix
	ERC 8d	Wide dispersive outdoor use of processing aids in open systems
	ERC 8f	Wide dispersive outdoor use resulting in inclusion into or onto a matrix
3. Operational conditions and risk management measures		
Product characteristics	Liquid products are on the market that may contain iron salts in concentrations up to 20 % w/w.	
Used amount of substance	In the majority of cases consumers will use no more than a few litres of product per event. The amount of iron salts that may be released to the environment hence is also limited to a few kg per event at the most. Liquid fertilisers and agrochemicals are applied in dilute aqueous solution (for example 500 mL liquids in 1.5 L water) by pouring or spraying at a rate of approximately 30 mL product/m ² .	
3.1 Controlling environmental exposure		
Frequency and duration of use	The greatest portion of products containing iron salts that are available to the public are infrequently used by consumers, for example on a monthly basis. Products can be distributed directly on the soil/lawn.	
Other given operational conditions affecting environmental exposure	Liquid products containing iron salts can be used indoors and outdoors and may be directly applied to the soil by pouring or spraying, such as in the case of fertilisers and agrochemical products.	
Conditions and measures related to municipal sewage treatment plant	Some uses of iron salts will lead to direct release of substance to the environment. The municipal sewage treatment plant considered in the modelling of environmental concentrations by default has a daily capacity of 2000 m ³ for those uses leading to release to the public sewerage system.	
Condition and measures related to external treatment of waste for disposal	Small amounts of product may remain in the packages which are disposed of via regular household waste. Solid wastes from private use are expected to be incinerated or disposed of in landfills in accordance with local environmental regulations.	
3.2 Controlling worker exposure		
No worker exposure is anticipated with the consumer use of iron salt products.		
3.3 Controlling consumer exposure		
Frequency and duration of use	The greatest portion of products containing iron salts that are available to the public are infrequently used by consumers, for example on a monthly basis.	
Human factors not influenced by risk management	A consumer has a breathing rate of 20 m ³ /day and a body weight of 60 kg by default.	
Other given operational conditions affecting consumer	Products may be used indoors or outdoors. It is recommended that the products are used in well ventilated areas only.	

exposure	
Conditions and measures related to information and behavioural advice to consumers	Liquid products should be used in well ventilated areas e.g. in the presence of open doors and windows.
Conditions and measures related to personal protection and hygiene	Usually it is not anticipated that consumers apply personal protection equipment. However, in the case of use of concentrated aqueous solutions of iron salt products, for example for metal surface treatment, it is recommended that consumers handling such products should use gloves, glasses and protective equipment since concentrated aqueous solutions of iron salts may have irritating or corrosive properties.

3.4 Controlling exposure during the service life of articles

Since the iron salts will be bound into the solid matrix of articles, no release of iron salts from articles during the service life is anticipated under reasonable use conditions.

4. Exposure estimation

4.1 Consumer exposure

Product type (iron salt content)	Scenario and conditions of use	Model	Inhalation exposure [mg/m ³]		Product type (iron salt content)
			Acute	Long-term	
Concentrated aqueous solutions: Metal etchants (40 % w/w) Fertilisers (20 % w/w) Wood coatings (10 % w/w)	Pouring of metal etchant solutions, 500 g, 1.33 min, 20 cm ² release area, 1 m ³ room volume	ConsExpo and RISKOFDERM	5.7 x 10 ⁻⁵	Negligible	0.067
	Immersion of metal parts, 0.3 to 1 metre from source, no local exhaust ventilation	ConsExpo and RISKOFDERM	2.57 x 10 ⁻⁶	Negligible	Hands: 47.6 Body: 1.23
	Mixing and loading of fertilisers, 3.3 L product	UK POEM	Negligible	Negligible	10
	Brushing of coatings, 1250 g, 10 m ² , 132 minutes	ConsExpo	1.95 x 10 ⁻⁶	Negligible	6
Dilute aqueous solutions of fertilisers (44 mg/mL)	Spraying of solutions, 15 L on 100 m ² , 30 minutes	UK POEM	1.056	0.022	11.86

4.2 Environmental exposure

Aquatic environment

Negligible emissions of iron into the aquatic environment are anticipated with the identified uses of iron salt products.

Terrestrial environment

Iron directly introduced into the terrestrial environment as a result of the use of iron salt products will not significantly alter the generally high natural background concentrations of this metal.

Atmospheric environment

The iron salts have very low vapour pressures. No significant formation of aerosols or dusts containing iron salts is anticipated with the identified uses of iron salt products.

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