

# SAFETY DATA SHEET

According to Commission Regulation (EU) № 2015/830

# **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 Nº 17375-41-6, EINECS Nº 231-753-5, REACH Registration Nº 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<sup>VI</sup> 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: nábř. 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.



#### 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, CO<sub>2</sub>. 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 (SO<sub>2</sub> and SO<sub>3</sub>).

#### 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. Contamined 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: Bsed 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

- I) Vapour density: Based on available data it is not applicable
- m) Relative density (at 20°C): 2650 kg/m<sup>3</sup> (bulk density 1450 kg/m<sup>3</sup>)
- n) Solubility in water: 295 kg/m<sup>3</sup> 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  $Fe_2O_3$ ,  $SO_2$  a  $SO_3$ .
- 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  $Fe_2O_3$ ,  $SO_3$  and  $SO_2$ .

#### 10.3. Possibility of hazardous reactions

Thermal decomposition with creation of  $SO_3$  and  $SO_2$ .

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 (SO<sub>3</sub> and SO<sub>2</sub>) irritate mucosa and respiratory tract.

### **SECTION 11: Toxicological information**

- 11.1. Information on toxicological effects
- a) Acute toxicity: oral adverse effect was observed at  $LD_{50} \ge 670$  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/m<sup>3</sup>).
- 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  $\geq$  1000 mg FeSO<sub>4</sub>x7 H<sub>2</sub>O/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 FeSO<sub>4</sub>; 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 – 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 – 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 Comission Regulation (EU) № 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) № 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 № 1999/45/EC and repealing Council Regulation (EEC) № 793/93 and Commission Regulation (EC) № 1488/94 as well as Council Directive № 76/769/EEC and Commission Directives № 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC

Regulation (EC) № 1272/2008 of the European Parliament and of the Council on classification, labelling and packaging of substances and mixtures, amending and repealing Directives № 67/548/EEC and 1999/45/EC, and amending Regulation (EC) № 1907/2006 Commission Regulation (EU) 2015/830 amending Regulation (EC) № 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

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

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

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

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

CZ Act № 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

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.

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.

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

products for land re	emediation	applications, manufacture of agrochemicals.
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 (		
Process Category	PROC 1	Closed process without breaching
(PROC)	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 01	Adhesive, sealant and coating
(AC)	AC 4	Stone, plaster, cement, glass and ceramic articles
Environment	ERC 1	Manufacture of substances
Release Category	ERC 2	Formulation of preparations
(ERC)	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
		s and risk management measures
Product characteris	tics	Solid powdery iron salt products that are manufactured, transferred, formulated,
		re-packaged, bagged, delivered to and handled by industrial downstream users.
Used amount of sul	bstance	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		
Frequency and dura	ation of	300 to 365 days a year; continuously or as batch processes.

use	
Technical onsite conditions and measures to reduce or limit discharges, air	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.
emissions and releases to soil	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 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 ex	xposure
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 <sup>3</sup> 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.
2.2 Controlling concumo	

#### 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 ex	osure		
<b>Estimated</b>	acute inh	alation e	exposure of industrial workers to powdery solid iron salt products
Process	LEV	Mask	Inhalation exposure in mg/m³ taking RMMs into account (based on product
category			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-teri	n exposi	ıre	

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	0.01	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)

раг	ticie size d				1	<u> </u>		. /			/1 . 1. / 1	/C. ==	1
	Pa	attern of co	ontrol								/kg bw/da		
PROC	Patter n of use	Expos ure contro	Conta ct level	Use of gloves		25 %		25 %		to 5 %	C = <		Exposed skin area
PR		L CO	ರಿಕತ	Us	Load	Dose	Load	Dose	Load	Dose	Load	Dose	in cm <sup>2</sup>
1	Closed system without breaches	Non- direct handling	None	No	0.000 5	0.001 7	0.000 3	0.001 0	0.000	0.000	0.00005	0.000 2	240
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	Incide ntal	No	0.000 5	0.001 7	0.000 3	0.001 0	0.000	0.000 3	0.00005	0.000 2	240
4	Wide dispersive	Direct	Extens	No	0.5	3.428 6	0.3	2.057 1	0.1	0.685 7	0.05	0.342 9	480
+	use	handling	ive	Yes	0.05	0.342 9	0.03	0.205 7	0.01	0.068 6	0.005	0.034 3	400
5	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000 3	0.002 1	0.000	0.000 7	0.00005	0.000 3	480
8a	Wide dispersive	Direct	Extens	No	0.5	6.857 1	0.3	4.114 3	0.1	1.371 4	0.05	0.685 7	960
- Ou	use	handling	ive	Yes	0.05	0.685 7	0.03	0.411 4	0.01	0.137 1	0.005	0.068 6	300
8b	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
9	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000	0.002 1	0.000	0.000 7	0.00005	0.000	480
14	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000	0.002 1	0.000	0.000 7	0.00005	0.000	480
15	Non- dispersive use	Direct handling	Incide ntal	No	0.005	0.017	0.003	0.010	0.001	0.003	0.0005	0.001 7	240
22	Non- dispersive use	Direct handling	Interm ittent	No	0.005	0.141 4	0.003	0.084 9	0.001	0.028 3	0.0005	0.014 1	1980
26	Wide dispersive	Direct	Extens	No	0.5	14.14 3	0.3	8.485 7	0.1	2.828 6	0.05	1.414 3	1980
20	use	handling	ive	Yes	0.05	1.414 3	0.03	0.848 6	0.01	0.282 9	0.005	0.141 4	1900

# 4.2 Environmental exposure

# **Aquatic environment**

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

PRECHEZA a.s. Exposure Scenarios Ferrous sulphate, EC 231-753-5 Page no. 4 of 28 Version 3 Effective since 01. 04. 2015

# **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**

#### **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

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.

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.

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. caacc .caa		applications, interface of agreements.
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 applic	cable
Process Category	PROC 1	Closed process without breaching
(PROC)	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 01	Adhesive, sealant and coating
(AC)	AC 4	Stone, plaster, cement, glass and ceramic articles
Environment	ERC 1	Manufacture of substances
Release Category	ERC 2	Formulation of preparations
(ERC)	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 o	<u>.                                      </u>	s and risk management measures
Product characteris		Solid granular iron salt products that are manufactured, transferred, formulated,
Troduct characteris	icics	re-packaged, bagged, delivered to and handled by industrial downstream users.
Used amount of sul	bstance	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.
		<u> </u>

3.1 Controlling environm	ental 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 ex	xposure
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 <sup>3</sup> 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**

Estimate	d acute inha	alation e	xposure of industrial workers to powdery solid iron salt products
Process	LEV	Mask	Inhalation exposure in mg/m³ taking RMMs into account (based on product
category			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

			enarios hate, EC	C <b>231</b> -7	753-5	;						ersion 3		01. 04.
			xposur		1-4:			. !!		L: <i>C</i>			6	
	cess			<u>rm inna</u> LEV		ratory	ure to	o iron sal Predicted				tion expos		
	egory	-	ninutes	LEV	mask	,		pure iron [mg/m³]			taking	RMMs into	o accou	nt (based
PRC	C 1	> 2	40 I	No	No			0.01			0.01			
	C 2	> 2		No	No			0.5			0.50			
	C 3	> 2		No	No			1			1.00			
	C 4	> 2		90 %	No			5			0.50			
	C 5	> 2		90 %	No			5			0.50			
	C 8a	> 2		90 %	No			5			0.50			
	C 8b	> 2		95 %	No			5			0.25			
	C 9	> 2		90 %	No			5			0.50			
	C 14	> 2		No	No			1			1.00			
	C 15	> 2		No	No			0.5			0.50			
	C 22	> 2		90 %	No			7			0.70			
	C 26	> 2		82 %	No			4			0.72			
						ron sal	ts re	sulting fr	om ind	ustrial		roducts	(indep	endent o
			of produ										(	
			attern of c				Derma	al load in m	ng/cm²; [	Dermal do	ose in mo	g/kg bw/da	y (for 70	kg)
	ter f		Expos ure contro	nta el	e of ves	C >	25 %	C = 5	to 25 %	C = 1	to 5 %	C = <		Exposed skin area
PROC	Patter n of	nse	Exp ure con	Conta ct level	Use o	Load	Dose	Load	Dose	Load	Dose	Load	Dose	in cm <sup>2</sup>
1	Closed syster without breact	n ut	Non- direct handling	None	No	0.000 5	0.00 7	1 0.000	0.001	0.000	0.000	0.00005	0.000	240
2	Non- disper use	sive	Non- direct handling	Incide ntal	No	0.000 5	0.00	3 0.000	0.002	0.000	0.000 7	0.00005	0.000	480
3	Non- disper use	sive	Non- direct handling	Incide ntal	No	0.000 5	0.00 7	1 0.000	0.001	0.000	0.000	0.00005	0.000	240
4	Wide	rais ra	Direct	Extens	No	0.5	3.42 6	8 0.3	2.057 1	0.1	0.685 7	0.05	0.342 9	400
4	disper use	sive	handling	ive	Yes	0.05	0.34 9	2 0.03	0.205 7	0.01	0.068 6	0.005	0.034 3	480
	Non	_	Mon		1	1			1		1		1	1

1	Closed system without breaches	Non- direct handling	None	No	0.000 5	0.001 7	0.000	0.001	0.000	0.000	0.00005	0.000 2	240
2	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000	0.002 1	0.000	0.000 7	0.00005	0.000	480
3	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000	0.001 7	0.000	0.001	0.000	0.000	0.00005	0.000	240
4	Wide	Direct	Extens	No	0.5	3.428 6	0.3	2.057 1	0.1	0.685 7	0.05	0.342 9	400
4	dispersive use	handling	ive	Yes	0.05	0.342 9	0.03	0.205 7	0.01	0.068 6	0.005	0.034 3	480
5	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000	0.002 1	0.000 1	0.000 7	0.00005	0.000	480
95	Wide	Direct	Extens	No	0.5	6.857 1	0.3	4.114 3	0.1	1.371 4	0.05	0.685 7	960
8a	dispersive use	handling	ive	Yes	0.05	0.685 7	0.03	0.411 4	0.01	0.137 1	0.005	0.068 6	960
8b	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000	0.002 1	0.000 1	0.000 7	0.00005	0.000	480
9	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000	0.002 1	0.000	0.000 7	0.00005	0.000	480
14	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000	0.002 1	0.000	0.000 7	0.00005	0.000	480
15	Non- dispersive use	Direct handling	Incide ntal	No	0.005	0.017 1	0.003	0.010 3	0.001	0.003 4	0.0005	0.001 7	240
22	Non- dispersive use	Direct handling	Interm ittent	No	0.005	0.141 4	0.003	0.084 9	0.001	0.028 3	0.0005	0.014	1980
26	Wide	Direct	Extens	No	0.5	14.14 3	0.3	8.485 7	0.1	2.828 6	0.05	1.414 3	1000
26	dispersive use	handling	ive	Yes	0.05	1.414 3	0.03	0.848 6	0.01	0.282 9	0.005	0.141 4	1980

4.2 Environmental exposure

PRECHEZA a.s. Exposure Scenarios Ferrous sulphate, EC 231-753-5 Page no. 8 of 28 Version 3 Effective since 01. 04. 2015

# **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**

Page no. 9 of 28 Version 3 Effective since 01. 04. 2015

#### **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

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.

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.

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

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-p.	
SU 13 Manufacture of non-metallic mineral products (pla	asters, 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 p	products, electrical equipment
SU 19 Building and construction work	
SU 24 Scientific research and development	
Product Category (PC) Not applicable	
Process Category PROC 1 Closed process without breaching	
(PROC) PROC 2 Use in closed, continuous processes with controlled	ed 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	ng, compression, extrusion,
pelletisation	
PROC 15 Use as laboratory agent	
PROC 22 Potentially closed processing operations with min	erals and metals at elevated
temperature	
PROC 26 Handling of solid inorganic substances at ambient	t temperature
Article Category AC 01 Adhesive, sealant and coating	
(AC) AC 4 Stone, plaster, cement, glass and ceramic articles	S
Environment ERC 1 Manufacture of substances	
Release Category   ERC 2   Formulation of preparations	
(ERC) ERC 4 Industrial use of processing aids in processes and of articles	d products, not becoming part
ERC 5 Industrial use resulting in inclusion into or onto a	matrix
ERC 6a Industrial use resulting in manufacture of another	
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 in the same products are manufactured in the same product of the sa	ctured, transferred, formulated.
re-packaged, bagged, delivered to and handled b	
Used amount of substance   It may range from a few hundred kilograms to hu	
some cases such as the laboratory use, a few gra	
the assessment of environmental exposure, a typ	
per m³ waste water and a reasonable highest use	e 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	nrocesses

limit dischar emissions a			
and measur limit dischar emissions a			
limit dischar emissions a		Equipment with dust abatement techniques to avoid atmospheric emi	
emissions a	res to reduce	much as possible. The most common abatement techniques include b	ag filters or
		wet scrubbing units.	
aa:I	nd releases to	The waste water produced in the and containing dissolved iron salts a	
soil		heavy metal impurities is either recycled in the processes or collected	l and
		treated, for example by means of precipitation, before released to fur	ther waste
		water treatment or the environment.	
Conditions a	and measures	The volume of waste water emitted per day is 2000 m <sup>3</sup> for the major	itv of
	ndustrial wast	processes (the standard condition in EUSES). The volumetric waste w	
	ment (onsite	can be changed by using the appropriate equation for scaling of the ri	
external)	mene (onsite t	characterisation ratios.	1310
	and measures	Industrial waste water produced at the sites is treated by precipitation	n to
	xternal recov		
of waste	xterrial recov	mainly in landfills according to local environmental regulations.	oseu oi
oi waste		mainly in failurins according to local environmental regulations.	
3.2 Contr	olling work	exposure	
	and duration o	Daily exposure occurring during a full working shift of 8 hours. A work	ker may be
use		exposed on 220 days per year under normal conditions.	,
		. , , ,	
Human fact	ors not influe	ed The worker under normal conditions has a breathing rate of 10 m <sup>3</sup> pe	er 8 hour
by risk man		shift. The exposed skin area per activity was used as defined in the M	
_,		exposure assessment tool.	·
Ì		C.F. Sai a assessment toon	
Technical co	onditions and	Processes, namely those involving the use of chlorine, hydrochloric, s	ulphuric or
	t process leve	nitric acids, are operated in enclosed systems.	aipilaile oi
	prevent relea	· · · · · · · · · · · · · · · · · · ·	
(Source) to	prevent relea		
Technical co	onditions and	The facilities where solid iron salt products are directly handled by wo	rkers
measures to	o control	should be equipped with efficient local exhaust ventilation systems.	
dispersion f		,	
towards the			
0 1111			
	and measures	In the absence of local exhaust ventilation workers directly handling s	
related to p		salt products should wear respiratory mask with appropriate dust filte	
	hygiene and	Workers directly handling solid iron salt products should wear chemic	
health evalu		gloves and safety goggles as well as appropriate working clothes and	haata
			DOOLS.
3.3 Contro		ner exposure	
3.3 Contro		ner exposure	
3.3 Contro	er exposure is	ner exposure nticipated with the industrial activities described in this exposure scenario	
No consume 3.4 Contro	er exposure is olling expo	ner exposure  nticipated with the industrial activities described in this exposure scenarioure during the service life of articles	).
No consume 3.4 Control Since the ire	er exposure is olling expo on salts will b	ner exposure  Inticipated with the industrial activities described in this exposure scenarion  Ire during the service life of articles  If oo ond into the solid matrix of articles, no release of iron salts from article	).
3.3 Control No consume 3.4 Control Since the irre the service	er exposure is olling expo on salts will b life is anticipa	ner exposure Inticipated with the industrial activities described in this exposure scenarious are during the service life of articles Incomplete the solid matrix of articles, no release of iron salts from article dunder reasonable use conditions.	).
3.3 Control No consume 3.4 Control Since the irre the service 4. Exposu	er exposure is olling expo on salts will b life is anticipa ire estimati	ner exposure Inticipated with the industrial activities described in this exposure scenarious are during the service life of articles Incomplete the solid matrix of articles, no release of iron salts from article dunder reasonable use conditions.	).
3.3 Control No consume 3.4 Control Since the irre the service 4. Exposu 4.1 Worke	er exposure is olling expo on salts will be life is anticipal are estimation exposure	nticipated with the industrial activities described in this exposure scenarion in the service life of articles bound into the solid matrix of articles, no release of iron salts from article d under reasonable use conditions.	).
3.3 Control No consume 3.4 Control Since the irrethe service 4. Exposur 4.1 Worke Exposure es	er exposure is olling expo on salts will b life is anticipa ure estimati er exposure stimates calcu	ner exposure Inticipated with the industrial activities described in this exposure scenarious are during the service life of articles Incomplete the solid matrix of articles, no release of iron salts from article dunder reasonable use conditions.	).
No consume 3.4 Contr Since the ire the service 4. Exposu 4.1 Worke Exposure es Acute exp	er exposure is olling expo on salts will b life is anticipa ire estimati er exposure stimates calcu oosure	ner exposure Inticipated with the industrial activities described in this exposure scenarion are during the service life of articles Into ound into the solid matrix of articles, no release of iron salts from article dunder reasonable use conditions.  Interest with the MEASE modelling tool.	s during
3.3 Control No consume 3.4 Control Since the irrethe service 4. Exposur 4.1 Worke Exposure es Acute exp Estimated	er exposure is olling expo on salts will b life is anticipa ire estimati er exposure stimates calcu oosure acute inhala	ner exposure Inticipated with the industrial activities described in this exposure scenarion are during the service life of articles Into ound into the solid matrix of articles, no release of iron salts from article dunder reasonable use conditions.  Interest with the MEASE modelling tool.  In exposure of industrial workers to powdery solid iron salt productions.	s during
3.3 Control No consume 3.4 Control Since the irrethe service 4. Exposur 4.1 Worke Exposure es Acute exp Estimated	er exposure is olling expo on salts will b life is anticipa ire estimati er exposure stimates calcu oosure	ner exposure Inticipated with the industrial activities described in this exposure scenarion are during the service life of articles Into ound into the solid matrix of articles, no release of iron salts from article dunder reasonable use conditions.  Interest with the MEASE modelling tool.  In exposure of industrial workers to powdery solid iron salt production in the production of the p	s during
3.3 Control No consume 3.4 Control Since the irrethe service 4. Exposure 4.1 Worke Exposure es Acute exp Estimated Process Category	er exposure is olling expo on salts will b life is anticipa ire estimati er exposure stimates calcu oosure acute inhala	nticipated with the industrial activities described in this exposure scenarion are during the service life of articles bound into the solid matrix of articles, no release of iron salts from article dunder reasonable use conditions.  1  ted with the MEASE modelling tool.  2  2  2  3  4  4  4  5  5  6  6  7  7  8  7  8  8  8  8  8  8  8  8  8	s during
No consumer 3.4 Control Since the irrethe service 4. Exposure 4.1 Worke Exposure exp	er exposure is olling expo on salts will b life is anticipa ire estimati er exposure stimates calcu oosure acute inhala	ner exposure Inticipated with the industrial activities described in this exposure scenarion are during the service life of articles Into ound into the solid matrix of articles, no release of iron salts from article dunder reasonable use conditions.  Interest with the MEASE modelling tool.  In exposure of industrial workers to powdery solid iron salt production in the production of the p	s during
3.3 Control No consume 3.4 Control Since the irrethe service 4. Exposure 4.1 Worke Exposure es Acute exp Estimated Process category PROC 1 N	er exposure is  olling expo on salts will b life is anticipa ire estimati er exposure stimates calcu posure acute inhala LEV M	nticipated with the industrial activities described in this exposure scenarion are during the service life of articles bound into the solid matrix of articles, no release of iron salts from article dunder reasonable use conditions.  1  ted with the MEASE modelling tool.  2  2  2  3  4  4  4  5  5  6  6  7  7  8  7  8  8  8  8  8  8  8  8  8	s during
3.3 Control No consume 3.4 Control Since the irrethe service 4. Exposure 4.1 Worke Exposure es Acute exp Estimated Process L category PROC 1 N PROC 2 N	er exposure is  olling expo on salts will b life is anticipa ire estimati er exposure stimates calcu oosure acute inhala EV M No N	nticipated with the industrial activities described in this exposure scenarion are during the service life of articles bound into the solid matrix of articles, no release of iron salts from article dunder reasonable use conditions.  The description of the MEASE modelling tool.  The description of the MEASE modelling tool.  The description of the MEASE modelling tool of the measure of the measu	s during
3.3 Control No consume 3.4 Control Since the interest the service 4. Exposure 4.1 Worke Exposure es Acute exp Estimated Process L category PROC 1 N PROC 2 N PROC 3 N	er exposure is  olling expo on salts will b life is anticipa ire estimati er exposure stimates calcu oosure acute inhala EV M No N No N	nticipated with the industrial activities described in this exposure scenarion are during the service life of articles bound into the solid matrix of articles, no release of iron salts from article dunder reasonable use conditions.  The description of the MEASE modelling tool.  The description of	s during
3.3 Control No consume 3.4 Control Since the interest the service 4. Exposure 4.1 Worke Exposure es Acute exp Estimated Process L category PROC 1 PROC 2 PROC 3 PROC 4 SERVICE PROC 5 PROC 4 SERVICE PROC 6 SERVICE PROC 6 SERVICE PROC 7 PROC 6 SERVICE PROC 7 P	er exposure is  olling expo on salts will b life is anticipa re estimati er exposure stimates calcu oosure acute inhala LEV M No N No N No N NO N NO N	ner exposure Inticipated with the industrial activities described in this exposure scenarion are during the service life of articles  bound into the solid matrix of articles, no release of iron salts from article dunder reasonable use conditions.  Interest with the MEASE modelling tool.  In exposure of industrial workers to powdery solid iron salt production are producted in the measure of industrial workers to powdery solid iron salt production are producted in the measure of industrial workers to powdery solid iron salt producted in this exposure of iron articles are producted in this exposure scenarion articles.  In exposure of industrial workers to powdery solid iron salt producted in this exposure scenarion articles.  In exposure of industrial workers to powdery solid iron salt producted in this exposure scenarion articles.  In exposure of industrial workers to powdery solid iron salt producted in this exposure in major articles.  In exposure of industrial workers to powdery solid iron salt producted in this exposure scenarion articles.	s during
3.3 Control No consume 3.4 Control Since the interestrice 4. Exposure 4.1 Worke Exposure es Acute exp Estimated Process L category PROC 1 N PROC 2 N PROC 3 N PROC 4 9 PROC 5 9	er exposure is  olling expo on salts will b life is anticipa ire estimati er exposure stimates calcu oosure acute inhala LEV M No N No N No N 00 % N 90 % N	ner exposure Inticipated with the industrial activities described in this exposure scenarion are during the service life of articles Into ound into the solid matrix of articles, no release of iron salts from article dunder reasonable use conditions.  Interest with the MEASE modelling tool.  In exposure of industrial workers to powdery solid iron salt production and into exposure in mg/m³ taking RMMs into account (based on procontaining >25 % iron salt)  0.020  2.000  2.000  5.000  5.000	s during
3.3 Control No consume 3.4 Control Since the interpretation the service 4. Exposure 4.1 Worke Exposure es Acute exp Estimated Process L category PROC 1 N PROC 2 N PROC 3 N PROC 4 9 PROC 5 9 PROC 8a 9	er exposure is  olling expo on salts will b life is anticipal re estimation er exposure stimates calcu- cosure acute inhala LEV M No N No N No N 00 % N 90 % N 90 % N	ner exposure Inticipated with the industrial activities described in this exposure scenarion are during the service life of articles Into ound into the solid matrix of articles, no release of iron salts from article dunder reasonable use conditions.  Interest with the MEASE modelling tool.  In exposure of industrial workers to powdery solid iron salt production and into exposure in mg/m³ taking RMMs into account (based on procontaining >25 % iron salt)  0.020  2.000  2.000  5.000  5.000  10.000	s during
3.3 Control No consume 3.4 Control Since the irrethe service 4. Exposure 4.1 Worke Exposure es Acute exp Estimated Process Category PROC 1 N PROC 2 N PROC 3 N PROC 4 S PROC 5 S PROC 8a S PROC 8b S	er exposure is  olling expo on salts will b life is anticipal re estimation er exposure stimates calcustosure acute inhala LEV M No N No	ner exposure Inticipated with the industrial activities described in this exposure scenarion are during the service life of articles Into ound into the solid matrix of articles, no release of iron salts from article dunder reasonable use conditions.  Interest with the MEASE modelling tool.  Inhalation exposure of industrial workers to powdery solid iron salt product with a service in mg/m³ taking RMMs into account (based on production in the service in mg/m³ taking RMMs into account (based on production in the service in mg/m³ taking RMMs into account (based on production in the service in mg/m³ taking RMMs into account (based on production in the service in mg/m³ taking RMMs into account (based on production in the service in mg/m³ taking RMMs into account (based on production in the service in mg/m³ taking RMMs into account (based on production in the service in mg/m³ taking RMMs into account (based on production in the service in mg/m³ taking RMMs into account (based on production in the service in mg/m³ taking RMMs into account (based on production in the service in mg/m³ taking RMMs into account (based on production in the service in mg/m³ taking RMMs into account (based on production in the service in mg/m³ taking RMMs into account (based on production in the service in mg/m³ taking RMMs into account (based on production in the service in mg/m³ taking RMMs into account (based on production in the service in mg/m³ taking RMMs into account (based on production in the service in mg/m³ taking RMMs into account (based on production in the service in mg/m³ taking RMMs into account (based on production in the service in mg/m³ taking RMMs into account (based on production in the service in mg/m³ taking RMMs into account (based on production in the service in mg/m³ taking RMMs into account (based on production in the service in mg/m³ taking RMMs into account (based on production in the service in mg/m³ taking RMMs into account (based on production in the service in mg/m³ taking RMMs into account (based on producti	s during
3.3 Control No consume 3.4 Control Since the irrethe service 4. Exposure 4.1 Worke Exposure es Acute exp Estimated Process category PROC 1 PROC 2 PROC 3 PROC 4 PROC 5 PROC 8a PROC 8b PROC 9	er exposure is  olling expo on salts will b life is anticipal ire estimation er exposure stimates calcustosure acute inhala LEV M No N No N No N 90 % N	nticipated with the industrial activities described in this exposure scenarion are during the service life of articles bound into the solid matrix of articles, no release of iron salts from article dunder reasonable use conditions.  The description of the matrix of articles, no release of iron salts from article dunder reasonable use conditions.  The description of the matrix of articles, no release of iron salts from article dunder reasonable use conditions.  The description of the matrix of articles of iron salts from article dunder reasonable use conditions.  The description of the matrix of articles of iron salts from articles of iron salts from articles of under reasonable use conditions.  The description of the matrix of articles of iron salts from articles of under reasonable use conditions.  The description of the matrix of articles of iron salts from articles of under reasonable use conditions.  The description of the matrix of articles of iron salts from articles of under reasonable use conditions.  The description of the matrix of articles of iron salts from articles of iron salts from articles of under reasonable use conditions.  The description of the matrix of articles of iron salts from articles of i	s during
3.3 Control No consume 3.4 Control Since the irrethe service 4. Exposure 4.1 Worke Exposure es Acute exp Estimated Process category PROC 1 PROC 2 PROC 3 PROC 4 PROC 5 PROC 8a PROC 8b PROC 9 PROC 14 PROC 14 PROC 9 PROC 14 P	er exposure is  olling expo on salts will b life is anticipal ire estimation er exposure stimates calcus cosure acute inhala LEV M No N No N No N 90 % N	nticipated with the industrial activities described in this exposure scenarion are during the service life of articles cound into the solid matrix of articles, no release of iron salts from article dunder reasonable use conditions.  The description of the MEASE modelling tool.  The description of	s during
3.3 Control No consume 3.4 Control Since the irrethe service 4. Exposure Exposure est Acute exp Estimated Process category PROC 1 PROC 2 PROC 3 PROC 4 PROC 5 PROC 8a PROC 8b PROC 9 PROC 14 PROC 14 PROC 15 PROC 14 PROC 15 PROC 15 PROC 14 PROC 15 P	er exposure is  olling expo on salts will b life is anticipal ire estimation er exposure stimates calcu- cosure acute inhala LEV M NO N NO N NO N OO N OO N OO N OO N OO	nticipated with the industrial activities described in this exposure scenarion reduring the service life of articles bound into the solid matrix of articles, no release of iron salts from article dunder reasonable use conditions.  1  The exposure of industrial workers to powdery solid iron salt product with the MEASE modelling tool.  2.000	s during
3.3 Control No consume 3.4 Control Since the irrethe service 4. Exposure Exposure es Acute exp Estimated Process category PROC 1 N PROC 2 N PROC 3 N PROC 4 S PROC 8a S PROC 8b S PROC 9 S PROC 14 S PROC 15 S PROC 15 S PROC 15 S PROC 15 S PROC 16 S PROC 17 S PROC 18 S PROC 19 S	er exposure is  olling expo on salts will b life is anticipal ire estimation er exposure stimates calculous coure acute inhala EV M NO N NO N NO N OO N OO N OO N OO N OO	nticipated with the industrial activities described in this exposure scenarion reduring the service life of articles bound into the solid matrix of articles, no release of iron salts from article dunder reasonable use conditions.  1  Teed with the MEASE modelling tool.  The exposure of industrial workers to powdery solid iron salt product with the measure in mg/m³ taking RMMs into account (based on production of the produc	s during
3.3 Control No consume 3.4 Control Since the interest the service 4. Exposure Exposure est Acute exp Estimated Process Category PROC 1 N PROC 2 N PROC 3 N PROC 4 S PROC 8a S PROC 8b S PROC 9 S PROC 14 S PROC 15 S PROC 15 S PROC 15 S PROC 15 S PROC 16 S PROC 17 S PROC 18 S	er exposure is  olling expo on salts will b life is anticipal ire estimation er exposure stimates calcu- cosure acute inhala LEV M NO N NO N NO N OO N OO N OO N OO N OO	nticipated with the industrial activities described in this exposure scenarion reduring the service life of articles bound into the solid matrix of articles, no release of iron salts from article dunder reasonable use conditions.  1  The exposure of industrial workers to powdery solid iron salt product with the MEASE modelling tool.  2.000	s during

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	0.01	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)

pai	ticie size d				ı								
	Pattern of control					Dermal load in mg/cm²; Dermal dose in mg/kg bw/day (for 70 kg)							
PROC	Patter n of use	Expos ure contro	Conta ct level	Use of gloves		25 %		:o 25 %		to 5 %	C = <		Exposed skin area
PR		TA NO _	Conta ct level	Use	Load	Dose	Load	Dose	Load	Dose	Load	Dose	in cm²
1	Closed system without breaches	Non- direct handling	None	No	0.000 5	0.001 7	0.000	0.001 0	0.000	0.000	0.00005	0.000	240
2	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000 3	0.002 1	0.000	0.000 7	0.00005	0.000 3	480
3	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.001 7	0.000 3	0.001 0	0.000 1	0.000 3	0.00005	0.000 2	240
4	Wide	Direct	Extens	No	0.5	3.428 6	0.3	2.057 1	0.1	0.685 7	0.05	0.342 9	480
4	dispersive use	handling	ive	Yes	0.05	0.342 9	0.03	0.205 7	0.01	0.068 6	0.005	0.034 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	0.000 7	0.00005	0.000 3	480
8a	Wide dispersive	Direct		No	0.5	6.857 1	0.3	4.114 3	0.1	1.371 4	0.05	0.685 7	960
oa	use	handling	ive	Yes	0.05	0.685 7	0.03	0.411 4	0.01	0.137 1	0.005	0.068 6	900
8b	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000 3	0.002 1	0.000	0.000 7	0.00005	0.000	480
9	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000	0.002 1	0.000 1	0.000 7	0.00005	0.000	480
14	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000	0.002 1	0.000 1	0.000 7	0.00005	0.000	480
15	Non- dispersive use	Direct handling	Incide ntal	No	0.005	0.017 1	0.003	0.010 3	0.001	0.003 4	0.0005	0.001 7	240
22	Non- dispersive use	Direct handling	Interm ittent	No	0.005	0.141 4	0.003	0.084 9	0.001	0.028 3	0.0005	0.014 1	1980
26	Wide	Direct	Extens	No	0.5	14.14 3	0.3	8.485 7	0.1	2.828 6	0.05	1.414 3	1000
26	dispersive use	handling	ive	Yes	0.05	1.414 3	0.03	0.848 6	0.01	0.282 9	0.005	0.141 4	1980

# **4.2 Environmental exposure**

# **Aquatic environment**

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

PRECHEZA a.s. Exposure Scenarios Ferrous sulphate, EC 231-753-5 Page no. 12 of 28 Version 3 Effective since 01. 04. 2015

# **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**

#### **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

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.

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.

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.

		applications, manufacture of agrochemicals.							
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	Not applic								
(PC)									
Process Category	PROC 1	Closed process without breaching							
(PROC)	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								
	PROC 9	Transfer into small containers							
		Roller application or brushing							
	PROC 13	Treatment of articles by dipping and pouring							
	PROC 15	7 11 3 1 3							
Autiala Catanau.									
Article Category	AC 01	Adhesive, sealant and coating							
(AC)	AC 4	Stone, plaster, cement, glass and ceramic articles							
Environment	ERC 1	Manufacture of substances							
Release Category	ERC 2	Formulation of preparations							
(ERC)	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 o	conditions	s and risk management measures							
Product characteris		Liquid mixtures containing iron salts that are manufactured, transferred,							
Froduct characteris	icics	formulated, re-packaged, loaded and unloaded, delivered to and handled by industrial downstream users.							
Used amount of su	bstance	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	environm	iental exposure							
Frequency and dura		300 to 365 days a year; continuously or as batch processes.							
Technical onsite co	nditions	The waste water produced in the and containing dissolved iron salts as well as							
		·							

refrous surpliate, LC 231	-755-5
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 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 e	
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 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 consume	r exposure
	cipated 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 bou	and 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 ex	Acute exposure										
		alation e	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 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-te	rm exposi	ire									

Occupati	Occupational long-term inhalation exposure to iron salts resulting from industrial use of products										
Process	Duration	LEV	Respiratory	Predicted exposure to	Inhalation exposure in mg/m <sup>3</sup>						
category	in minutes		mask	pure iron salt; no RMMs	taking RMMs into account (based						
				[mg/m³]	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						
Occumati	anal darma	Lavnacu	ua ta iuan salta ua	aulting fram industrial .	ico of products (indopondent of						

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

par	particle size of products)												
	Pa	attern of co	ontrol			Dermal load in mg/cm <sup>2</sup> ; Dermal dose in mg/kg bw/day (for 70 kg)							
၂	ter	Expos ure contro	nta el	Use of gloves	C >	25 %	C = 5 t	to 25 %	C = 1	to 5 %	C = <	1 %	Exposed skin area
PROC	Patter n of use	Exp ure con	Conta ct level	Use glo	Load	Dose	Load	Dose	Load	Dose	Load	Dose	in cm²
1	Closed system without breaches	Non- direct handling	None	No	0.000 5	0.001 7	0.000	0.001 0	0.000	0.000	0.00005	0.000	240
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	Incide ntal	No	0.000 5	0.001 7	0.000	0.001 0	0.000	0.000	0.00005	0.000 2	240
4	Wide dispersive	Direct	Extens	No	0.5	3.428 6	0.3	2.057 1	0.1	0.685 7	0.05	0.342 9	480
	use	handling	ive	Yes	0.05	0.342 9	0.03	0.205 7	0.01	0.068 6	0.005	0.034 3	400
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
7	Wide dispersive	Direct	Extens	No	0.5	3.428 6	0.3	2.057 1	0.1	0.685 7	0.05	0.342 9	480
	use	handling	ive	Yes	0.05	0.342 9	0.03	0.205 7	0.01	0.068 6	0.005	0.034 3	700
8a	Wide dispersive	Direct	Extens	No	0.5	6.857 1	0.3	4.114 3	0.1	1.371 4	0.05	0.685 7	960
	use	handling	ive	Yes	0.05	0.685 7	0.03	0.411 4	0.01	0.137 1	0.005	0.068 6	300
8b	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
9	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000	0.002 1	0.000	0.000 7	0.00005	0.000	480
10	Wide dispersive	Direct	Extens	No	0.5	1.714 3	0.3	1.028 6	0.1	0.342 9	0.05	0.171 4	240
	use	handling	ive	Yes	0.05	0.171 4	0.03	0.102 9	0.01	0.034 3	0.005	0.017 1	240
12	Non- dispersive use	Direct handling	Interm ittent	No	0.005	0.034 3	0.003	0.020 6	0.001	0.006 9	0.0005	0.003 4	480
13	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
15	Non- dispersive use	Direct handling	Incide ntal	No	0.005	0.017 1	0.003	0.010 3	0.001	0.003 4	0.0005	0.001 7	240

PRECHEZA a.s. Exposure Scenarios Ferrous sulphate, EC 231-753-5 Page no. 16 of 28 Version 3 Effective since 01. 04. 2015

# 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**

### **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.

uses associated wit	h similar o	ccupational 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 applic							
Process Category	PROC 1	Closed process without breaching						
(PROC)	PROC 2	Use in closed, continuous processes with controlled exposure						
	PROC 3	Jse 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,						
	FROC 14	pelletisation						
	PROC 15							
	PROC 22	Ose as laboratory agent  Potentially closed processing operations with minerals and metals at elevated						
	FROC 22	temperature						
	PROC 26	Handling of solid inorganic substances at ambient temperature						
Article Category	AC 01	Adhesive, sealant and coating						
(AC)	AC 4							
Environment	ERC 8a							
Release Category	ERC 8c	Wide dispersive indoor use resulting in inclusion into or onto a matrix						
(ERC)	ERC 8d	Wide dispersive indeed use resulting in inclusion into or once a matrix  Wide dispersive outdoor use of processing aids in open systems						
(2.10)	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						
	LIKC OI	Wide dispersive outdoor use resulting in inclusion into or onto a matrix						
		s and risk management measures						
Product characteris	tics	Solid powdery iron salt products that are transferred, re-packaged, bagged, delivered to and handled by professional downstream users.						
Used amount of sul	bstance	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.						
		nental exposure						
Frequency and dura	ation of	The majority of processes are running on less than 300 days per year.						
use		Professional uses are batch processes in the majority of cases.						
Technical onsite co	nditions	Equipment with dust abatement techniques to avoid atmospheric emissions, for						
and measures to re		example bag filters.						
limit discharges, air		The waste water produced in the processes and containing dissolved iron salts						
emissions and releasions	ases to	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 mea	asures	The volume of waste water emitted per day is 2000 m <sup>3</sup> for the majority of						
related to industria		processes (the standard condition in EUSES). The volumetric waste water flow						
water treatment (a	it	and he should be using the appropriate equation for applied of the viels						

water treatment (onsite or | 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 ex	xposure
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 <sup>3</sup> 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 consume	r 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 inha	alation e	xposure of professional workers to powdery solid iron salt products
Process	LEV	Mask	Inhalation exposure in mg/m³ taking RMMs into account (based on product
category			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

Occupation	nal long-te	erm inha	lation exposure t	o iron salts resulting fro	m 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	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

	r e	os rol	tac el	of es	C > 1	25 %	C = 5 t	o 25 %	C = 1	to 5 %	C = < 1 %		Exposed skin area
	Patter n of use	Expos ure control	Contac t level	Use of gloves	Load	Dose	Load	Dose	Load	Dose	Load	Dose	in cm <sup>2</sup>
2	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000	0.002 1	0.000	0.000 7	0.00005	0.000	480
3	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.001 7	0.000	0.001	0.000	0.000 4	0.00005	0.000	240
4	Wide dispersive use	Direct handling	Extens ive	No	0.5	3.428 6	0.3	2.057 1	0.1	0.685 7	0.05	0.342 9	480
5	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000	0.002 1	0.000	0.000 7	0.00005	0.000	480
8a	Wide dispersive		Extens	No	0.5	6.857 1	0.3	4.114 3	0.1	1.371 4	0.05	0.685 7	960
oa	use		ive	Yes	0.05	0.685 7	0.03	0.411 4	0.01	0.137 1	0.005	0.068 6	960
8b	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000	0.002	0.000	0.000 7	0.00005	0.000	480
9	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000	0.002	0.000	0.000 7	0.00005	0.000	480
14	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000	0.002 1	0.000	0.000 7	0.00005	0.000	480
15	Non- dispersive use	Direct handling	Incide ntal	No	0.005	0.017 1	0.003	0.010	0.001	0.003 4	0.0005	0.001 7	240
26	Non- dispersive	Direct	Incide	No	0.5	14.14 3	0.3	8.485 7	0.1	2.828 6	0.05	1.414 3	1000
26	use	handling	ntal	Yes	0.05	1.414 3	0.03	0.848 6	0.01	0.282 9	0.005	0.141 4	1980

# 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**

### **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

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.

uses associated wit	th similar o	ccupational professional activities.								
Sector of Use (SU)		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 applic	able								
Process Category	PROC 1	Closed process without breaching								
(PROC)	PROC 2	Use in closed, continuous processes with controlled exposure								
	PROC 3	Use in closed batch process								
	PROC 4	Jse 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 01	Adhesive, sealant and coating								
(AC)	AC 4	Stone, plaster, cement, glass and ceramic articles								
Environment	ERC 8a	Wide dispersive indoor use of processing aids in open systems								
Release Category	ERC 8c	Wide dispersive indoor use resulting in inclusion into or onto a matrix								
(ERC)	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								
		s and risk management measures								
Product characteris	stics	Solid granular iron salt products that are transferred, re-packaged, bagged,								
		delivered to and handled by professional downstream users.								
Used amount of su	bstance	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								
2.4.0		waste water were considered.								
		nental exposure								
Frequency and dura	ation of	The majority of processes are running on less than 300 days per year.								
use		Professional uses are batch processes in the majority of cases.								
Technical onsite co		Equipment with dust abatement techniques to avoid atmospheric emissions, for								
and measures to re		example bag filters.								
limit discharges, ai emissions and relea		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								
	ases to	of precipitation, before released to further waste water treatment or the								
soil		environment.								
Conditions and mea	acurac	The volume of waste water emitted per day is 2000 m <sup>3</sup> for the majority of								
related to industria		processes (the standard condition in EUSES). The volumetric waste water flow								
water treatment (o		can be changed by using the appropriate equation for scaling of the risk								
external)	TISICE OI	characterisation ratios.								
Conditions and mea	asures	Waste water produced at the sites is treated by precipitation to remove iron and								
related to external	recovery	heavy metal impurities. The resulting solids are disposed of mainly in landfills								
of waste		according to local environmental regulations.								

3.2 Controlling worker ex	3.2 Controlling worker exposure										
Frequency and duration of	Daily exposure occurring during a full working shift of 8 hours. A worker may be										
use	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 <sup>3</sup> 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.

Exposure es	Exposure estimates carculated with the MEASE modelling tool.									
Acute exp	osure									
<b>Estimated</b>	acute inha	alation e	xposure 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

Occupation	Occupational long-term inhalation exposure to iron salts resulting from professional use of products											
Process	Duration	LEV	Respiratory	Predicted exposure to	Inhalation exposure in mg/m <sup>3</sup>							
category	in		mask	pure iron salt; no RMMs	taking RMMs into account (based							
	minutes			[mg/m³]	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)

	Pa	attern of co	ontrol			Dermal load in mg/cm²; Dermal dose in mg/kg bw/day (for 70 kg)								
ن	er so		ntac	of es	C > 25 %		C = 5 to 25 %		C = 1 to 5 %		C = < 1 %		Exposed skin area	
PROC	Patte n of use	Expos ure contro	Cont t lev	Use	Load	Dose	Load	Dose	Load	Dose	Load	Dose	in cm <sup>2</sup>	
2	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000	0.002 1	0.000	0.000 7	0.00005	0.000	480	
3	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.001 7	0.000	0.001	0.000	0.000 4	0.00005	0.000	240	

4	Wide dispersive use	Direct handling	Extens ive	No	0.5	3.428 6	0.3	2.057 1	0.1	0.685 7	0.05	0.342 9	480
5	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000	0.002 1	0.000	0.000 7	0.00005	0.000	480
0.0	8a Wide dispersive use Direct handling	Extens	No	0.5	6.857 1	0.3	4.114 3	0.1	1.371 4	0.05	0.685 7	060	
8a		handling	ive	Yes	0.05	0.685 7	0.03	0.411 4	0.01	0.137 1	0.005	0.068 6	960
8b	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000	0.002 1	0.000	0.000 7	0.00005	0.000	480
9	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000	0.002 1	0.000	0.000 7	0.00005	0.000	480
15	Non- dispersive use	Direct handling	Incide ntal	No	0.005	0.017 1	0.003	0.010	0.001	0.003 4	0.0005	0.001 7	240
26	Non-	Incide	No	0.5	14.14 3	0.3	8.485 7	0.1	2.828 6	0.05	1.414 3	1980	
20	use	handling	ntal	Yes	0.05	1.414 3	0.03	0.848 6	0.01	0.282 9	0.005	0.141 4	1900

### 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**

### **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.

		essional use in land remediation applications, in use in agrochemicals and in other						
		ccupational professional activities.						
Sector of Use (SU)		Agriculture, forestry, fishery						
İ	SU 13	Manufacture of non-metallic mineral products (plasters, cement)						
	SU 19	Building and construction work						
<del> </del>	SU 24	Scientific research and development						
Product Category (PC)	Not applic	able						
Process Category	PROC 1	Closed process without breaching						
(PROC)	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						
İ	PROC 10							
İ	PROC 15	Heaps laboratory agent						
İ	PROC 15							
A. E. ala Cata mana		Handling of solid inorganic substances at ambient temperature						
Article Category	AC 01	Adhesive, sealant and coating						
(AC)	AC 4	Stone, plaster, cement, glass and ceramic articles						
Environment	ERC 8a	Wide dispersive indoor use of processing aids in open systems						
Release Category	ERC 8c	Wide dispersive indoor use resulting in inclusion into or onto a matrix						
(ERC)	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						
		and risk management measures						
Product characteris	tics	Solid coarse iron salt products that are transferred, re-packaged, bagged, delivered to and handled by professional downstream users.						
Used amount of sub	ostance	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						
İ		m <sup>3</sup> waste water and a reasonable highest use amount of 250 g iron per m <sup>3</sup>						
<u> </u>		waste water were considered.						
3.1 Controlling								
Frequency and dura	ation of	The majority of processes are running on less than 300 days per year.						
use		Professional uses are batch processes in the majority of cases.						
Technical onsite cor		Equipment with dust abatement techniques to avoid atmospheric emissions, for						
and measures to re		example bag filters.						
limit discharges, air		The waste water produced in the processes and containing dissolved iron salts						
emissions and relea		as well as heavy metal impurities is collected and treated, for example by mear						
	ases to							
soil	ises to	of precipitation, before released to further waste water treatment or the						
soil	ases to	of precipitation, before released to further waste water treatment or the environment.						
soil  Conditions and mea		of precipitation, before released to further waste water treatment or the environment.  The volume of waste water emitted per day is 2000 m³ for the majority of						
	asures	of precipitation, before released to further waste water treatment or the environment.  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						
Conditions and mea related to industrial water treatment (or	asures I waste	of precipitation, before released to further waste water treatment or the environment.  The volume of waste water emitted per day is 2000 m³ for the majority of						
Conditions and mea related to industrial water treatment (or external)	asures I waste nsite or	of precipitation, before released to further waste water treatment or the environment.  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 mea related to industrial water treatment (or external) Conditions and mea	asures I waste nsite or asures	of precipitation, before released to further waste water treatment or the environment.  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.  Waste water produced at the sites is treated by precipitation to remove iron and						
Conditions and mea related to industrial water treatment (or external)	asures I waste nsite or asures	of precipitation, before released to further waste water treatment or the environment.  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 mea related to industrial water treatment (or external) Conditions and mea	asures I waste nsite or asures	of precipitation, before released to further waste water treatment or the environment.  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.  Waste water produced at the sites is treated by precipitation to remove iron and						
Conditions and mea related to industrial water treatment (or external) Conditions and mea related to external	asures I waste nsite or asures recovery	of precipitation, before released to further waste water treatment or the environment.  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.  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.						
Conditions and mea related to industrial water treatment (or external) Conditions and mea related to external of waste	asures I waste nsite or asures recovery	of precipitation, before released to further waste water treatment or the environment.  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.  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.						

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.
0.0.0	

#### 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**

<b>Estimated</b>	Estimated acute inhalation exposure of professional workers to 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 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

p					
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	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)

	Pa	attern of co			Dermal load in mg/cm²; Dermal dose in mg/kg bw/day (for 70 kg)								
PROC Patter n of	S Solo		rol el		S C > 25 %		C = 5 to 25 %		C = 1 to 5 %		C = < 1 %		Exposed skin area
	Patter n of use	Expos ure control	Contac t level	Use	Load	Dose	Load	Dose	Load	Dose	Load	Dose	in cm²
2	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000	0.002 1	0.000	0.000 7	0.00005	0.000	480
5	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000	0.002 1	0.000	0.000 7	0.00005	0.000	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	Incide ntal	No	0.000 5	0.003 4	0.000	0.002 1	0.000	0.000 7	0.00005	0.000	480													
9	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000	0.002	0.000	0.000 7	0.00005	0.000	480													
10	Wide	spersive   Direct		No	0.5	3.428 6	0.3	2.057 1	0.1	0.685 7	0.05	0.342 9	400													
10	use			Yes	0.05	0.342 9	0.03	0.205 7	0.01	0.068 6	0.005	0.034 3	480													
15	Non- dispersive use	Direct handling	Incide ntal	No	0.005	0.017	0.003	0.010	0.001	0.003 4	0.0005	0.001 7	240													
26	Non- dispersive Direc	spersive Direct Ir	Incide	No	0.5	14.14 3	0.3	8.485 7	0.1	2.828 6	0.05	1.414 3	1980													
/h	use																ntal	Yes	0.05	1.414 3	0.03	0.848 6	0.01	0.282 9	0.005	0.141 4

# 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**

3.2 Controlling worker exposure

### **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 (FeSO4, 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

		pressional use of cements, professional use as laboratory agent, professional use
		essional use in land remediation applications, in use in agrochemicals and in other
		ccupational professional activities.
Sector of Use (SU)		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 applic	cable
Process Category	PROC 1	Closed process without breaching
(PROC)	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
	1110015	available
Article Category	AC 01	Adhesive, sealant and coating
(AC)	AC 4	Stone, plaster, cement, glass and ceramic articles
Environment	ERC 8a	Wide dispersive indoor use of processing aids in open systems
Release Category	ERC 8c	Wide dispersive indoor use resulting in inclusion into or onto a matrix
(ERC)	ERC 8d	Wide dispersive indoor use of processing aids in open systems
(LIC)	ERC 8e	Wide dispersive outdoor use of processing alds in open systems  Wide dispersive outdoor use of reactive substances in open systems
	ERC 8f	Wide dispersive outdoor use of reactive substances in open systems  Wide dispersive outdoor use resulting in inclusion into or onto a matrix
2 0	4	
		s and risk management measures
Product characteris		Liquid mixtures containing iron salts that are transferred, re-packaged, bagged, delivered to and handled by professional downstream users.
Used amount of sul	bstance	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		
Frequency and dura	ation of	The majority of processes are running on less than 300 days per year.
use		Professional uses are batch processes in the majority of cases.
Technical onsite co		The waste water produced in the processes and containing dissolved iron salts
and measures to reduce or		as well as heavy metal impurities is collected and treated, for example by means
limit discharges, air		of precipitation, before released to further waste water treatment or the
emissions and releases to		environment.
soil		
Conditions and measures		The volume of waste water emitted per day is 2000 m³ for the majority of
related to industria		processes (the standard condition in EUSES). The volumetric waste water flow
water treatment (o	nsite or	can be changed by using the appropriate equation for scaling of the risk
external)		characterisation ratios.
Conditions and mea	asures	Waste water produced at the sites is treated by precipitation to remove iron and
related to external		heavy metal impurities. The resulting solids are disposed of mainly in landfills
of waste	,	according to local environmental regulations.
1		

Frequency and duration of	Daily exposure occurring during a full working shift of 8 hours. A worker may be			
use	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 <sup>3</sup> 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				

#### 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**

<b>Estimated</b>	acute inha	alation e	exposure of industrial workers to iron salt products
Process	LEV	Mask	Inhalation exposure in mg/m³ taking RMMs into account (based on product
category			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

Occupation	Occupational long-term inhalation exposure to iron salts resulting from professional use of products							
Process	Duration	LEV	Respiratory	Predicted exposure to	Inhalation exposure in mg/m³			
category	in		mask	pure iron salt; no RMMs	taking RMMs into account (based			
	minutes			[mg/m³]	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

	Pattern of control					Dermal load in mg/cm <sup>2</sup> ; Dermal dose in mg/kg bw/day (for 70 k							ka)
U	n 8 6		s ol ol		C > 25 %		C = 5 to 25 %		C = 1 to 5 %		C = < 1 %		Exposed skin area
PROC	Patter n of use Expos ure contr	Expc ure cont	cont Cont t lev	t lev Use glov	Load	Dose	Load	Dose	Load	Dose	Load	Dose	in cm <sup>2</sup>
2	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003	0.000	0.002	0.000	0.000 7	0.00005	0.000	480

3	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.001 7	0.000	0.001	0.000	0.000 4	0.00005	0.000	240
4	Wide dispersive use	Direct handling	Extens ive	No	0.5	3.428 6	0.3	2.057 1	0.1	0.685 7	0.05	0.342 9	480
5	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000	0.002	0.000	0.000 7	0.00005	0.000	480
0.0	Wide dispersive	Direct	Extens	No	0.5	6.857 1	0.3	4.114 3	0.1	1.371 4	0.05	0.685 7	960
8a	use	handling	ive	Yes	0.05	0.685 7	0.03	0.411 4	0.01	0.137	0.005	0.068 6	960
8b	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000	0.002	0.000	0.000 7	0.00005	0.000	480
9	Non- dispersive use	Non- direct handling	Incide ntal	No	0.000 5	0.003 4	0.000	0.002	0.000	0.000 7	0.00005	0.000	480
10	Wide	Direct	Extens	No	0.5	3.428 6	0.3	2.057 1	0.1	0.685 7	0.05	0.342 9	400
10	dispersive use	handling	ive	Yes	0.05	0.342 9	0.03	0.205 7	0.01	0.068 6	0.005	0.034	480
11	Wide	Direct	Extens	No	0.5	3.428 6	0.3	2.057 1	0.1	0.685 7	0.05	0.342 9	480
11	dispersive use	handling	ive	Yes	0.05	0.342 9	0.03	0.205 7	0.01	0.068 6	0.005	0.034	460
13	Non- dispersive use	Direct handling	Interm ittent	No	0.005	0.034 3	0.003	0.020 6	0.001	0.006 9	0.0005	0.003 4	480
15	Non- dispersive use	Direct handling	Incide ntal	No	0.005	0.017	0.003	0.010	0.001	0.003 4	0.0005	0.001 7	240
19	Non- dispersive	Direct	Extens	No	0.5	14.14 3	0.3	8.485 7	0.1	2.828 6	0.05	1.414 3	1980
19	use	handling	ive	Yes	0.05	1.414 3	0.03	0.848 6	0.01	0.282 9	0.005	0.141 4	1900

# 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**

### **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

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.

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.

The ES is applicable to the use in cements, in etching metals, use in agrochemicals and also in other uses

associated with sim	ilar consumer	activities.			
Sector of Use (SU)					
Product Category	PC 1	Adhesives, sealants			
(PC)	PC 9b	Fillers, putties, plasters, modelling clay			
(* -)	PC 12	Fertilisers			
	PC 14	Metal surface treatment products, including galvanic and electroplating			
	1 6 1 1	products			
	PC 27	Plant protection products			
Process Category	Not applicabl				
(PROC)	Troc applicable				
Article Category	AC 01	Adhesive, sealant and coating			
(AC)	AC 4	Stone, plaster, cement, glass and ceramic articles			
Environment	ERC 8a	Wide dispersive indoor use of processing aids in open systems			
Release Category	ERC 8c	Wide dispersive indoor use resulting in inclusion into or onto a matrix			
(ERC)	ERC 8d	Wide dispersive outdoor use of processing aids in open systems			
-7	ERC 8f	Wide dispersive outdoor use resulting in inclusion into or onto a matrix			
3 Operational c	<u>.</u>	nd 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 $20 \text{ g/m}^2$ .			
3.1 Controlling					
Frequency and dura	ation of use	Low for the individual consumer, but daily use is considered for the assessment of environmental concentrations.			
Other given operatic conditions affecting environmental expo	l	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			

#### 3.2 Controlling worker exposure

Condition and measures related to external treatment of waste

for disposal

No worker exposure is anticipated with the consumer use of iron salt products.

environmental regulations.

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 m³/day and a body weight of 60 kg by default.			

2000 m³ for those uses leading to release to the public sewerage system. Small amounts of product may remain in the packages which are disposed of

be incinerated or disposed of in landfills in accordance with local

via regular household waste. Solid wastes from private use are expected to

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	Model	Inhalation [mg,	Dermal dose [mg/kg	
(Iron sait content)	use		Acute	Long-term	bw/day]
Non-dusty fertilisers (80 % w/w)	Manual distribution of granules/flakes, 2 kg on 100 m <sup>2</sup> , 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**

### **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 (FeSO4, 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

The ES is applicable to the use in cements, in etching metals, use in agrochemicals and also in other uses							
associated with sim							
Sector of Use (SU)		le					
Product Category	PC 1	Adhesives, sealants					
(PC)	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	Not applicab	le					
(PROC)		Tanana arang menanggan kenanggan beranggan beranggan beranggan beranggan beranggan beranggan beranggan beranggan					
Article Category	AC 01	Adhesive, sealant and coating					
(AC)	AC 4	Stone, plaster, cement, glass and ceramic articles					
Environment	ERC 8a	Wide dispersive indoor use of processing aids in open systems					
Release Category	ERC 8c	Wide dispersive indoor use resulting in inclusion into or onto a matrix					
(ERC)	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 of	conditions a	nd risk management measures					
Product characteris	tics	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 <sup>2</sup> .					
3.1 Controlling	environme						
Frequency and dura	ation 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.					

3.1 Controlling environmen	ital 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 <sup>3</sup> 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 Co	ntrollin	a consiim	er exposure

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	A consumer has a breathing rate of 20 m³/day and a body weight of 60 kg by					
risk management	default.					
Other given operational	Products may be used indoors or outdoors. It is recommended that the					
conditions affecting consumer	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

4.1 consumer exposure							
Product type (iron salt content)	Scenario and conditions of	Model	Inhalation exposure [mg/m³]		Product type (iron salt		
	use		Acute	Long-term	content)		
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 <sup>2</sup> release area, 1 m <sup>3</sup> room volume	ConsExpo and RISKOFDERM	5.7 x 10 <sup>-5</sup>	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 <sup>-6</sup>	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 <sup>2</sup> , 132 minutes	ConsExpo	1.95 x 10 <sup>-6</sup>	Negligible	6		
Dilute aqueous solutions of fertilisers (44 mg/mL)	Spraying of solutions, 15 L on 100 m <sup>2</sup> , 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**