 police Zakłady Chemiczne „POLICE” S.A.	Safety Data Sheet <i>according to Regulation (EC) 1907/2006</i>		SDS-ZChP- 013/10 version 02	
	Iron (II) sulphate		The date of:	
			compilation	revision
			09.11.2010	12.04.2011

SECTION 1: Identification of the substance and of the company/undertaking

1.1. Product identifier

Product name	Iron(II) sulphate(VI) monohydrate	Iron(II) sulphate(VI) heptahydrate
Trade name	FESPOL	FESPOL
Synonyms	Ferrous sulphate monohydrate, , iron (II) sulphate (VI), monohydrate of iron (II) sulphate(VI), monohydrate of ferrous sulphate	Ferrous sulphate heptahydrate, ferrous sulphate, iron (II) sulphate (VI), heptahydrate of iron (II) sulphate(VI), heptahydrate of ferrous sulphate
Molecular formula	FeSO4 * H2O	FeSO4 * 7H2O
CAS Number	17375-41-6	7782-63-0
EC Number	231-753-5	231-753-5
Registration number	01-2119513203-57-0011	

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

As a coagulant for water and sewage treatment, an additive to cement, production of ferric pigments, as an additive to fodder premixtures.

1.3. Details of the supplier of the safety data sheet

Zakłady Chemiczne „POLICE” S.A.
 Internet: www.zchpolice.com

Kuznicka 1, 72-010 Police, Poland
Phone no: + 48 91 317 1090
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A person responsible for Safety Data Sheet Chief Process Engineer: Piotr Masztalerz /PhD eng/
 Phone no. + 48 91 317 1569;
 Tele-Fax: + 48 91 317 3946;
 e-mail: pmasztalerz@zchpolice.com

1.4. Emergency telephone number

Chief Dispatcher Alarm telephone no: + 48 91 317 1616 (24h)
 Telephone no: + 48 91 317 4201 (24h)

SECTION 2: Hazards identification

2.1. Classification of the substance

Substance classification according to Regulation (EC) No 1272/2008

Hazard Class and Category Code	Acute Tox. 4 Eye Irrit. 2 Skin Irrit. 2 Skin Sens. 1
Hazard Statement	H302 H319 H315

H317

Substance classification according to Directive 67/548/EWG

Hazard symbol	Xn Xi
Risk phrases	R22, R36/38, R43
Safety advice appearing	S 2, 46

*Explanation phrases in section 16***Human Health effects***Skin effect*

Slight irritation of the skin is likely to appear.

Eyes effect

Irritation of the eyes felt for long time is likely to appear.


Swallowing

Swallowing of small amount is do not cause toxic effect.
Swallowing a large amount leads to nausea, vomiting, diarrhoea, drop of blood pressure. Upon absorption of large doses cardiovascular disturbances and toxic action towards liver and kidneys follow.

Inhalation

High concentration of dust in the air may cause cough and irritation of nose and respiratory tract.

2.2. Label elementsLabel elements according to Regulation (EC) No 1272/2008

Pictogram	 GHS07
Signal Word	Warning
Hazard Statement	H302 H319 H315 H317
Precautionary Statement	P270 P280 P301+P312 P302+P352 P305+P351+P338

*Explanation phrases in section 16***2.3. Other hazards**

Iron sulphate is neither a PBT nor a vPvB substance.

Iron sulphate is skin sensitization due to the presence of nickel.

SECTION 3: Composition/information on ingredients**3.1. Substances****Iron(II) sulphate monohydrate**

By-product from titanium dioxide production by sulphate methods containing as a main component the iron sulphate monohydrate with chemical formula of $\text{FeSO}_4 \cdot \text{H}_2\text{O}$ (85.5%). Iron content in product as Fe^{+2} is 28.2%. Besides the product contains less than 0.3% of free acids (as sulphuric acid).

Dangerous ingredient	CAS number	EC number (EINECS)
Iron(II) sulphate monohydrate	17375-41-6	231-753-5

Iron(II) sulphate heptahydrate

By-product from titanium dioxide production by sulphate methods containing as a main component the iron sulphate heptahydrate with chemical formula of $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ (75.7 - 97%). Iron content in product as Fe^{+2} is ca.15.0 - 19.5%. Besides the product contains less than 1.0% of free acids (as sulphuric acid).

Dangerous ingredient	CAS number	EC number (EINECS)
Iron(II) sulphate heptahydrate	7782-63-0	231-753-5

SECTION 4: First aid measures

4.1. Description of first aid measures

<i>Inhalation</i>	Remove the injured person from the contaminated area. Ensure access to the fresh air. Seek medical help if injured person is not getting better.
<i>Skin contact</i>	The contaminated clothes and shoes should be removed and the contaminated skin areas washed with water and soap
<i>Eye contact</i>	Rinse eyes profusely for at least 10 minutes with plenty of water. Ensure the proper by separating eyelids with fingers. If the irritation persists, provide medical assistance.
<i>Swallowing</i>	Give plenty of water to drink if the injured person is conscious. Cause vomiting. Give medical assistance if injured is not getting better.

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

Ingestion of large amounts leads to nausea, vomiting, diarrhea, drop in blood pressure. Cardiovascular disorders and toxic effects on the liver and kidneys occur after taking large amounts.

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

Medical assistance is needed in case of inhalation of large amounts of dust.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media	Inflammable substance. Use extinguishing means suitable for materials stored in the immediate neighbourhood.
Unsuitable extinguishing media	No data

5.2. Special hazards arising from the substance

Fire and products of thermal decomposition

- Inhalation of gases produced during thermal decomposition may cause irritation and may be corrosive to the respiratory system. The effect on lungs may be delayed.

Fire and heating

- When heated the product loses crystalline water. In case of fire, a toxic vapours containing sulphur oxides may be released.

In case of inhalation of the burning product

Persons exposed to inhalation of gases produced during decomposition should immediately obtain the medical assistance.

When the product is exposed to the fire

Call the fire brigade. Keep safe distance. Avoid inhalation of the fumes. Evacuate upwind or in direction perpendicular to direction of the wind. Use suitable mask during fire extinguishing. Use breathing apparatus if fumes are released. Use plenty of water. Open the doors and windows of the store to give maximum ventilation. If water containing dissolved product enters any drains or watercourse, inform local authorities immediately.

5.3. Advice for firefighters

Standard protective equipment for firefighters.

SECTION 6: Accidental release measures**6.1. Personal precautions, protective equipment and emergency procedures**

When there is excessive dust wear dustproof goggles and masks to protect the respiratory system.

6.2. Environmental precautions

Maintain caution, to avoid contamination of water and sewage system. Inform the local authority if accidental contamination occurs.

6.3. Methods and material for containment and cleaning up

Any spillage of iron(II) sulphate should be cleaned up promptly (avoiding dusting) and placed in a clean, labelled container for safe disposal (recycling or neutralization) according to the rules and regulations of environmental protection.

6.4. Reference to other sections

Information about personal precautions - see Section 8.

Information about waste disposal - see Section 13.

SECTION 7: Handling and storage**7.1. Precautions for safe handling**

Handling of product can cause dust formation and eventually dust breathing. Transport and handling system should reduce dust generation to a minimum. Avoid excessive generation of dust. Avoid unnecessary exposure to atmosphere to prevent moisture absorption. While handling with the product wear protective clothes, protective gloves, protective glasses of goggle type and anti-dust masks of P2 class.

7.2. Conditions for safe storage, including any incompatibilities

Keep the product away from heat sources and fire. Ensure high quality of cleaning in storage facilities. Storage buildings should be dry and well ventilated.

7.3. Specific end use(s)

Exposure scenarios for identified uses are attached to this safety data sheet.

SECTION 8: Exposure controls/personal protection**8.1. Control parameters****DNELs for workers**

Acute - systemic effects	Dermal	DNEL ¹ : 0.57 mg/kg bw/d
Acute - systemic effects	Inhalation	DNEL: 2.01 mg/m ³
Long-term - systemic effects	Dermal	DNEL: 0.57 mg/kg bw/d

¹ DNEL (Derived No-Effect Level) Poziom dawkowania (stężenie), przy którym nie obserwuje się szkodliwych zmian

Long-term - systemic effects	Inhalation	DNEL: 2.01 mg/m ³
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DNELs for the general population

Acute - systemic effects	Dermal	DNEL: 0.29 mg/kg bw/d
Acute - systemic effects	Inhalation	DNEL: 0.5 mg/m ³
Acute - systemic effects	Oral	DNEL: 0.29 mg/kg bw/d
Long-term - systemic effects	Dermal	DNEL: 0.29 mg/kg bw/d
Long-term - systemic effects	Inhalation	DNEL: 0.5 mg/m ³
Long-term - systemic effects	Oral	DNEL: 0.29 mg/kg bw/d

PNEC²

PNEC STP	500 mg/L
PNEC sediment (freshwater)	49,5 mg/kg sediment dw
PNEC sediment (marine water)	49,5 mg/kg sediment dw
PNEC soil	55.5 mg/kg soil dw

8.2. Exposure controls

Prevent excessive dust formation and provide local exhaust ventilation where it's necessary.

Personal protection measures

Eye protection

If the concentration of dust may be exceeded, it is recommended to use goggles to protect against dust or glasses with side walls (adhering tightly to the eyes).

Skin protection

Observe the principles concerning protective clothing when handling chemicals. Protect your skin by wearing appropriate clothing, eg overalls.

Hand protection

Avoid prolonged exposure through appropriate impervious gloves.

Respiratory protection

If dust concentrations exceed the permissible concentration in the working environment, use the mask. It is recommended to use an approved dust respirator, depending on the concentration of dust and other factors in the workplace.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

State of the substance at 20°C and 101.3 kPa	Solid
Melting/freezing point	anhydrous 300°C (decomposes without melting) monohydrate 300°C (water loss) heptahydrate 60°C (water loss)
Boiling point	Data not required
Relative density	anhydrous: 3.65 g/cm ³ monohydrate 3.0 g/cm ³ heptahydrate 1.895 g/cm ³
Water solubility	Anhydrous above 400 g/L at ambient conditions. Monohydrate and heptahydrate 295 g/L in 25°C
Vapour pressure	Data not required
Surface tension	Data not required

² PNEC Predicted No-Effect Concentration

Partition coefficient n-octanol/water	Not applicable or appropriate for this substance
Dissociation constant	pKa = 3.05
Oxidising properties	Negative (READ ACROSS)
Flash-point	Data not required
Flammability	Negative (READ ACROSS)
Explosive properties	Data not required
Self-ignition temperature	Negative (READ ACROSS)
Stability in organic solvents and identity of relevant degradation products	Data not required
Viscosity	Data not required

9.2. Other information

No other information.

SECTION 10: Stability and reactivity

10.1. Reactivity

Non reactive during storage, use and application in normal conditions.

10.2. Chemical stability

Depending on storage conditions may occur moisture absorption from the air. Therefore the storage time should be as short as possible.

10.3. Possibility of hazardous reactions

Sulphur oxides.

10.4. Conditions to avoid

Humidity. Hygroscopic substance. Heating above the temperature of thermal decomposition (> 600°C). Sulphur oxides formation.

10.5. Incompatible materials

Bases, soluble carbonates, strong oxidising agents.

10.6. Hazardous decomposition products

Unknown.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity	LD50 ³ (oral)	2000 mg/kg bw (rat)
	LD50 (dermal)	>2000 mg/kg bw Iron (II) sulphate (to > 881 mg Fe/kg bw)
Irritation/Corrosivity	Skin	Irritation
	Eye	Irritation
Repeated dose toxicity	NOAEL ⁴	49 days ~ 100 mg/kg bw/day Iron (II) sulphate heptahydrate
Mutagenicity	-	Genetic toxicity: negative
Carcinogenicity	-	There are no carcinogenicity data for iron sulfate, but based on data available for the iron trichloride salt it is not expected to be carcinogenic.
Toxicity for reproduction	NOAEL	≥1000 mg/kg bw/day (rat) (≥200 mgFe/kg bw/day) (Iron (II) sulphate heptahydrate)

³ LD50 Median Lethal Dose .

⁴ NOAEL No Observed Adverse Effect Level

SECTION 12: Ecological information**12.1. Toxicity**

Iron sulphate does not fulfill the T criteria.

Aquatic compartment (including sediment)

Short-term toxicity to fish	96 h LC50 ⁵ <i>Salvelinus fontinalis</i> = 0.41 mg/L (measured dissolved Fe) at pH 5.5 [0.48 mg/L at pH 6.0 and 1.8 mg/l at pH 7.0] (Iron (II) sulphate)
Long-term toxicity to fish	12 month NOEC ⁶ <i>Pimephales promelas</i> = 0.24 mg/l (nominal Fe) (Iron (II) sulphate) 90-day NOEC <i>Oncorhynchus kisutch</i> growth of alevins 0.97 mg/L (measured total Fe) (Iron (II) sulphate) 90-day NOEC <i>Salvelinus fontinalis</i> Hatching, survival and growth of alevins 10.5 mg/L (measured total Fe) (Iron (II) sulphate)
Short-term toxicity to aquatic invertebrates	24 h EC50 ⁷ <i>Daphnia magna</i> = 5.3 mg/L – Immobility (pH 7.6) (Iron (II) sulphate) 24 h EC50 <i>Daphnia pulex</i> = 36.9 mg/L – Immobility (pH 7.6) (Iron (II) sulphate) 24 h EC50 <i>Daphnia magna</i> = 17 mg/L – Survival (pH range not reported) (Iron (II) sulphate)
Long-term toxicity to aquatic invertebrates	21 days NOEC <i>Daphnia magna</i> = 10 mg Fe/L Reproduction (at pH 7.0-8.5) (Iron (II) sulphate heptahydrate) 15 days NOEC <i>Arrenurus manubriator</i> (Water mite) = 800 mg Fe/L Deutonymph mortality Adult male mortality (at pH 4.0) (Iron (II) sulphate heptahydrate) 15 days NOEC <i>Chironomus riparius</i> (Midge) = 1000 mg Fe/L Egg hatch. Larval mortality (at pH 4.0) (Iron (II) sulphate heptahydrate)
Algae and aquatic plants	72 h EC50 <i>Pseudokirchneriella subcapitata</i> = 18 mg/l (measured total Fe) [92 mg/L mean measured concentration of test substance]

Terrestrial compartment**Toxicity to terrestrial plants**

Straw and grain yield of *Triticum aestivum* have been shown to increased at treatment levels of 5 and 10 ppm Fe [mg Fe/kg] but reduced by a treatment of 20 ppm Fe [mg Fe/kg] of the test substance. The results can be interpreted as a NOEC of 10 ppm and LOEC of 20 ppm for reduction in straw and grain yield.

Atmospheric compartment

The true vapour pressure of the salts is negligibly low. All the salts are highly soluble in water (apart from ferric sulfate, which is slowly soluble but rapidly soluble in the presence of a trace of ferrous sulfate). Therefore partition to air is expected to be low (see section 4 of the CSR). Furthermore, the iron salts are extremely abundant in the environment, with high natural background concentrations. Therefore, there is no indication that any of the salts would cause adverse affects in the atmosphere.

Non compartment specific effects relevant for the food chain (secondary poisoning)**Toxicity to birds**

A NOEC of ≥ 400 ppm (mg/kg) has been determined for the effects of the test substance on

⁵ LC50 Lethal concentration

⁶ NOEC No Observed Effect Concentration

⁷ EC50 Half maximal effective concentration

weight gain in Gallus domesticus chicks following two weeks dietary exposure.

Long-term or reproductive toxicity to birds

14-day NOEC (body weight) = >400 mg Fe/kg

12.2. Persistence and degradability

Iron sulphate does not fulfill the P nor vP criteria.

12.3. Bioaccumulative potential

Iron sulphate does not fulfill the B nor vB criteria.

12.4. Mobility in soil

Soluble in water.

12.5. Results of PBT and vPvB assessment

Iron sulphate is neither a PBT nor a vPvB substance.

12.6. Other adverse effects

No data.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Product remains, including packaging wastes, should be transferred to the specialized companies with an appropriate waste management permits.

In case of spill of iron (II) sulphate, see - Section 6 of the safety data sheet.

SECTION 14: Transport information

Dry iron (II) sulphate is sent in "big-bag" packages of 500 or 1000 kg or loaded in bulk on lorries or tank lorries. It is not classified, that means it is not considered as a dangerous material according to Orange Book of UN and international transport codes, eg. RID (railway), ADR (roads transport) and IMDG (see transport).

14.1. UN number

Not applicable.

14.2. UN proper shipping name

Not applicable.

14.3. Transport hazard class(es)

Not applicable.

14.4. Packing group

Not applicable.

14.5. Environmental hazards

Not applicable.

14.6. Special precautions for user

Not applicable.

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

Not applicable.

SECTION 15: Regulatory information**15.1. Safety, health and environmental regulations/legislation specific for the substance**

- Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18th December 2006 concerning Registration, Evaluation, Authorization and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EEC and 2000/21/EC. (*Official Journal of the European Union of 30.12.2006, L 396. with later changes*)
- Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labeling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (*Official Journal of the European Union of 31.12.2008, L 353. with later changes*)

15.2. Chemical safety assessment


The chemical safety assessment has been made.

SECTION 16: Other information

R phrases	R22 - Harmful if swallowed R36/38 - Irritating to eyes and skin R43 - May cause sensitisation by skin contact
S phrases	S2 - Keep out of the reach of children S46 - If swallowed, seek medical advice immediately and show this container or label
Symbols	Xn - Harmful Xi - Irritant
H phrases	H302 - Harmful if swallowed H319 - Causes serious eye irritation. H315 - Causes skin irritation. H317 - May cause an allergic skin reaction
P phrases	P270 - Do not eat, drink or smoke when using this product. 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.
Category Code(s)	Acute Tox. 4 - Acute toxicity category 4 Eye Irrit. 2 - Eye irritation category 2 Skin Irrit. 2 - Skin irritation category 2 Skin Sens. 1 - Skin sensitization category 1
Training	Employees should be trained in the proper substance handling. Read the safety data sheet before use.
Changes	Section 1, 11, 12.

Attachments:

- ES02 Generic formulation including pelletisation
- ES03 Water treatment: treatment of raw and potable waters
- ES04 Water treatment: treatment of waste waters and WWTP sludge
- ES05 Use as reactive product/precursor
- ES06 Manufacture of cement
- ES07 Industrial use of cement
- ES08 Professional use of cement
- ES09 Professional use of selected iron salts in land remediation applications
- ES10 Use as a laboratory chemical (industrial)
- ES11 Use as a laboratory chemical (professional)
- ES12 Use in Agrochemicals (professional)
- ES13 Adhesives Sealants and Coatings (industrial)
- ES14 Adhesives Sealants and Coatings (professional)
- ES15 Consumer use of cement
- ES16 Use in Agrochemicals (consumer)
- ES17 Adhesives Sealants and Coatings (consumer)

 police Zakłady Chemiczne „POLICE” S.A.	EXPOSURE SCENARIO ES 02	ES-02/SDS-ZChP - 013/10 version 01	
	Iron (II) sulphate	The date of:	
		compilation	revision
		09.11.2010	-

ES 02 – Generic formulation including palletisation

1. Short title of the exposure scenario:

Generic formulation including palletisation.

Sector of end use (SU):

SU3	Industrial uses: Uses of substances as such or in preparations at industrial sites
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SU10	Formulation [mixing] of preparations and/or repackaging (excluding alloys)
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Market sector by type of chemical product (PC):

PC14	Metal surface treatment products, including galvanic and electroplating products
PC15	Non-metal-surface treatment products
PC20	Products such as ph-regulators, flocculants, precipitants, neutralization agents
PC37	Water treatment chemicals

List of names of contributing worker scenarios and corresponding PROCs:

PROC1	Use in closed process, no likelihood of exposure
PROC2	Use in closed, continuous process with occasional controlled exposure
PROC3	Use in closed batch process (synthesis or formulation)
PROC4	Use in batch and other process (synthesis) where opportunity for exposure arises
PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
PROC14	Production of preparations or articles by tableting, compression, extrusion, palletisation
PROC15	Use as laboratory reagent

Name of contributing environmental scenario and corresponding ERC:

ERC2	Formulation of preparations
ERC5	Industrial use resulting in inclusion into or onto a matrix

Article category related to subsequent service life (AC):

–	Not applicable
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2. Environmental exposure controls

	ERC 2, 5.
Product Characteristics	The iron salts are most frequently manufactured and used in the form of aqueous formulations. Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered).
Concentration of substance in mixture or articles	Not applicable

Amounts used	Used amount of substance per day 170 kg salt; 420 kg solution Annual amount used per site 50 t/y.
Frequency and duration of use	Emission days per site 300 d/y.
Environmental factors not influenced by risk management	Effluent (of the waste water treatment plant) discharge rate 2000 m ³ /d.
Other given operational conditions affecting environmental exposure	<u>Formulation associated with use in water treatment (raw/potable waters):</u> Manufacturers' datasheets for relevant iron salts mention the need to dissolve or dilute the as-supplied products prior to use for treatment of raw water. In the case of raw water intended for public supply this would be at a facility dedicated to water treatment; in the case of industry this would be at the industrial site where the water will be used. Formulation is carried out by specialist formulators at the point of use. <u>Formulation associated with use in water treatment (waste waters/ WWTP sludges)</u> Formulation for this application is essentially a dilution step to produce the required concentration, where supplied as solid or concentrate.
Technical conditions and measures at process level (source) to prevent release	Formulation is carried out by specialist formulators at the point of use.
Technical on-site conditions and measures to reduce or limit discharges, air emissions and release to soil	Any solid wastes are ultimately assumed to be disposed of via landfill or incineration. Details of the treatment of aqueous waste would vary at different sites but as a minimum the effluent treated in either in on-site or municipal secondary biological treatment plants prior to discharge.
Risk management measures - air	Air (direct + STP) 0 kg/d.
Risk management measures - water	Aquatic (before WWTP) 485 kg/d These data correspond to release to sewage.
Risk management measures - soil	Soil (direct only) 0 kg/d.
Risk management measures - other	Any solid wastes are ultimately assumed to be disposed of via landfill or incineration. Details of the treatment of aqueous waste would vary at different sites but as a minimum the effluent treated in either in on-site or municipal secondary biological treatment plants prior to discharge.
Organizational measures to prevent/limit release from site	No data
Conditions and measures related to on-site or municipal sewage treatment plant	Municipal or other type of external waste water treatment Effluent (of the waste water treatment plant) discharge rate 2000 m ³ /d.
Conditions and measures related to external treatment of waste for disposal	Not applicable
Conditions and measures related to external recovery of waste	Not applicable

3. Control of worker exposure

	PROC 1, 2, 3, 4, 5, 8a, 8b , 9, 14, 15.
Product Characteristics	
Concentration of substance in mixture or articles	No data
Physical state	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered).
Amounts used	No data
Frequency and duration of use	Daily, up to 8 hours.
Human factors not influenced by risk management	Body parts potentially exposed: dermal exposure, inhalation exposures. <u>Skin protection</u> protective gloves <u>Eye protection</u> safety glasses <u>Respiratory protection</u> If handling solid salts , filter mask, in the absence of LEV.
Other given operational conditions affecting workers exposure	Dermal exposure is most likely to occur through accidental spillage or during formulation (transfer and charging of storage, mixing, and feed vessels), where mechanical handling is not in place. <u>Dermal local exposure</u> (in $\mu\text{g}/\text{cm}^2$): 400 (PROC5, in absence of LEV) The wearing of gloves is accounted for in this value. <u>Dermal systemic exposure via contact with substance as such</u> (in mg/kg bw/d): 0.7 (PROC4) The limitation of 10% dermal uptake is assumed in deriving this value. <u>Dermal systemic exposure via aqueous solution</u> (in mg/kg bw/d): 0.07 (PROC4) The limitation of <1% dermal uptake is assumed in deriving this value. <u>Inhalation exposure</u> (in mg/m^3)/8h workday (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts). a) Negligible, assuming any solids are processed only in a closed system. b) 1.8 (PROC8a, 8b).(LEV but no PPE).
Technical conditions and measures at process level (source) to prevent release	It is assumed that solid salts are handled only in closed systems.
Technical conditions and measures to control dispersion from source towards the worker	Procedural and control technologies. It is assumed that solid salts are handled only in closed systems or with LEV.
Organizational measures to prevent /limit releases, dispersion and exposure	Training. Monitoring/reporting and auditing systems: Equipment must be well maintained and cleaned daily. Containment plus good work practice required.
Conditions and measures related to personal protection, hygiene and health evaluation	There is no worker exposure under normal conditions (LEV, closed process, liquid form). However there is required the use of personal protective equipment in order to minimize the risk exposure. See section 8 of the SDS.

 <p>police Zakłady Chemiczne „POLICE” S.A.</p>	EXPOSURE SCENARIO ES 03	ES-03/SDS-ZChP - 013/10 version 01	
	Iron (II) sulphate	The date of:	
		compilation 09.11.2010	revision -

ES 03 – Water treatment: treatment of raw and potable waters

1. Short title of the exposure scenario:

Water treatment: treatment of raw and potable waters.

Sector of end use (SU):

SU3	Industrial uses: Uses of substances as such or in preparations at industrial sites
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SU0	Other
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Market sector by type of chemical product (PC):

PC20	Products such as ph-regulators, flocculants, precipitants, neutralization agents
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PC37	Water treatment chemicals
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List of names of contributing worker scenarios and corresponding PROCs:

PROC2	Use in closed, continuous process with occasional controlled exposure
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PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
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PROC 8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities
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PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
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Name of contributing environmental scenario and corresponding ERC:

ERC4	Industrial use of processing aids in processes and products, not becoming part of articles
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Article category related to subsequent service life (AC):

–	Not applicable
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2. Environmental exposure controls

	ERC 4
Product Characteristics	Liquid (aqueous solution) or solid salts (assumed to be in granular/flake form rather than powdered).
Concentration of substance in mixture or articles	Not applicable
Amounts used	Used amount of substance per day: Approx. 1800 kg iron salt per day. (approx. 700 kg Fe/day). Annual amount used per site 210 T Fe/y.
Frequency and duration of use	Emission days per site 300 d/y.
Environmental factors not influenced by risk management	Effluent (of the waste water treatment plant) discharge rate 2000 m ³ /d.
Other given operational conditions affecting environmental exposure	<u>Potable water:</u> Water treatment is understood to be a continuous process. Re-loading of treatment additives may be needed more or less frequently, to refresh the system. The salts are supplied in a variety of packaging types, ranging from tankers and IBCs to 25kg pails or bags. For the risk characterization, what is assessed is release back to the environment after use by the

	<p>consumer.</p> <p><u>Pulp and paper production:</u> An example of an industrial process which uses copious volumes of water is pulp and paper production; Pumped dosing is the method most commonly used for the addition of chemicals such as iron salts to the water supply of a paper mill. Chemicals are supplied in a wide range of containers from 25 litre pails to 100 litre drums to 1 tonne tanks.</p>
Technical conditions and measures at process level (source) to prevent release	There is clearly the potential for spillage and accidental release during transfer to the feed tank or equivalent. Given the low volatility and the high water solubility of the substances, direct releases to air and soil can be considered negligible; thus it can be assumed that the entire release is via water and not volatilized.
Technical on-site conditions and measures to reduce or limit discharges, air emissions and release to soil	Any solid wastes are ultimately assumed to be disposed of via landfill or incineration. Details of the treatment of aqueous waste would vary at different sites but as a minimum the effluent treated in either in on-site or municipal secondary biological treatment plants prior to discharge.
Risk management measures - air	<u>Industrial use (potable water):</u> 0 <u>Industrial use (industrial locations):</u> 0
Risk management measures - water	<u>Industrial use (potable water):</u> Amount per day 0.4 kg/day WWTP flow (default) – 2,000 m ³ /day <u>Industrial use (industrial locations):</u> Amount per day 4 kg/day WWTP flow (default) – 2,000 m ³ /day
Risk management measures - soil	<u>Industrial use as a coagulant</u> Surface water (in mg/l) 2.6E-06a Freshwater sediment (in g/kg dwt) 45.0 Agricultural soil (in g/kg dwt) 50.0 <u>Industrial use in sludge conditioning</u> Surface water (in mg/l) 2.6E-06a Freshwater sediment (in g/kg dwt) 45.0 Agricultural soil (in g/kg dwt) 50.1
Risk management measures - other	Any solid wastes are ultimately assumed to be disposed of via landfill or incineration. Details of the treatment of aqueous waste would vary at different sites but as a minimum the effluent treated in either in on-site or municipal secondary biological treatment plants prior to discharge.
Organizational measures to prevent/limit release from site	No data
Conditions and measures related to on-site or municipal sewage treatment plant	Municipal or other type of external waste water treatment Effluent (of the waste water treatment plant) discharge rate 2000 m ³ /d.
Conditions and measures related to external treatment of waste for disposal	Not applicable
Conditions and measures related to external recovery of waste	Not applicable

3. Control of worker exposure

	PROC 2, 5, 8a, 8b.
Product Characteristics	
Concentration of substance in mixture or articles	No data
Physical state	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered).
Amounts used	No data
Frequency and duration of use	Daily, up to 8 hours.
Human factors not influenced by risk management	Body parts potentially exposed: dermal exposure, inhalation exposures. <u>Skin protection</u> protective gloves <u>Eye protection</u> safety glasses <u>Clothing</u> working clothing worn. <u>Respiratory protection</u> If handling solid salts , filter mask, in the absence of LEV.
Other given operational conditions affecting workers exposure	Dermal exposure is most likely to occur through accidental spillage or during dosing of the waste water, where mechanical handling is not in place. <u>Dermal local exposure in</u> ($\mu\text{g}/\text{cm}^2$) 400 (PROC5, in absence of LEV) The wearing of gloves is accounted for in this value. <u>Dermal systemic exposure</u> via contact with substance as such (in mg/kg bw/d) 0.3 (PROC8a) The limitation of 10% dermal uptake is assumed in deriving this value. <u>Dermal systemic exposure</u> via aqueous solution (in mg/kg bw/d) 0.03 (PROC8a) The limitation of <1% dermal uptake is assumed in deriving this value. <u>Inhalation exposure</u> estimates have not performed since the iron salts used in this exposure scenario are non-volatile, and formulated and used in the form of solution. <u>Inhalation exposure</u> (in mg/m^3)/8h workday (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts). a) 1.8 (PROC8a, 8b).(LEV but no PPE). b) 2.01 (PROC8a, 8b). Containment and mechanical/natural ventilation; and PPE (Filter mask P2 (FFP2)) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily.
Technical conditions and measures at process level (source) to prevent release	Water treatment is understood to be a continuous process.
Technical conditions and measures to control dispersion from source towards the worker	Procedural and control technologies: if handling solid salts, LEV OR containment and ventilation must be available.
Organizational measures to prevent /limit releases, dispersion and exposure	Training. Monitoring/reporting and auditing systems: Equipment must be well maintained and cleaned daily. Containment plus good work practice required.
Conditions and measures related to personal protection, hygiene and health evaluation	There is no worker exposure under normal conditions (LEV, closed process, liquid form). However there is required the use of personal protective equipment in order to minimize the risk exposure. See section 8 of the SDS.

 police Zakłady Chemiczne „POLICE” S.A.	EXPOSURE SCENARIO ES 04	ES-04/SDS-ZChP - 013/10 version 01	
	Iron (II) sulphate	The date of:	
		compilation	revision
		09.11.2010	-

ES 04 – Water treatment : treatment of waste waters and WWWT sludge

1. Short title of the exposure scenario:

Water treatment : treatment of waste waters and WWWT sludge.

Sector of end use (SU):

SU3	Industrial uses: Uses of substances as such or in preparations at industrial sites
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SU0	Other
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Market sector by type of chemical product (PC):

PC20	Products such as ph-regulators, flocculants, precipitants, neutralization agents
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List of names of contributing worker scenarios and corresponding PROCs:

PROC2	Use in closed, continuous process with occasional controlled exposure
PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Name of contributing environmental scenario and corresponding ERC:

ERC4	Industrial use of processing aids in processes and products, not becoming part of articles
ERC5	Industrial use resulting in inclusion into or onto a matrix

Article category related to subsequent service life (AC):

–	Not applicable
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2. Environmental exposure controls

	ERC 4, 5.
Product Characteristics	Liquid (aqueous solution) or solid salts (assumed to be in granular/flake form rather than powdered).
Concentration of substance in mixture or articles	Not applicable
Amounts used	Used amount of substance per day . Water treatment: 200 kg Fe/day assuming 2000 m ³ effluent Sludge treatment: approx. 34 kg Fe/day based on approx. 28 m ³ sludge/d. Annual amount used per site 85 T Fe/y.
Frequency and duration of use	Emission days per site 365 d/y.
Environmental factors not influenced by risk management	Effluent (of the waste water treatment plant) discharge rate 2000 m ³ /d.
Other given operational conditions affecting environmental exposure	Waste water treatment is understood to be a continuous process. Reloading of treatment additives may be needed more or less frequently, to refresh the system. The worst case for the local environment is to assume treatment in a large treatment plant,


	open system, which requires the use of large volumes of a high concentration product on a continuous basis and involves the direct release of effluent to the river or receiving water.
Technical conditions and measures at process level (source) to prevent release	In this scenario, the term “coagulant” use is used to describe the scenario in which iron salts are added to waste water at a WWTP to achieve removal of some dissolved or dispersed contaminant. Use as a coagulant is associated with formation of a coagulant matrix (in this case containing iron) and it is reasonable to assume that the majority of the iron added to the system will be settled out in the form of a bound matrix, which may be processed for disposal or the iron salts may be recovered for reuse.
Technical on-site conditions and measures to reduce or limit discharges, air emissions and release to soil	<p>It is necessary to consider what loading levels are typically used for different purposes at different types of WWTPs, and the stage of the treatment that the iron salts are loaded, in order to consider the quantity which may pass to treated effluent and hence to the environment, and also, importantly, to consider the fate of the iron after use.</p> <p><u>Municipal WWTP:</u></p> <ul style="list-style-type: none"> – Relief flocculation (usually a preprecipitation process) This is a temporary arrangement rather than a routine one, used in case of WWTP overload; during renovation; or in case of additional purification needed due to highly polluted influent (i.e. for a specific influent stream). – Sulfide control (outdoor control) (usually a pretreatment before primary sedimentation) – Phosphate removal. The iron passes to organic digester sludge, which will be spread to land, only under certain circumstances – Any solid wastes are ultimately assumed to be disposed of via landfill or incineration. <p>Details of the treatment of aqueous waste would vary at different sites but as a minimum the effluent treated in either in on-site or municipal secondary biological treatment plants prior to discharge.</p>
Risk management measures - air	See below
Risk management measures - water	It has been reported that iron salts do not cause additional environmental iron loading to surface water. Based on data provided by the industry, iron salts in fact reduce the iron levels of influent water.
Risk management measures - soil	<p>A summary of the local releases to air, waste water and industrial soil is given below.</p> <p><u>Industrial use (potable water)</u> Fraction in formulation – 0.007 Number of days – 365 Amount per day – 200 kg Fe/day assuming 2,000 m³ effluent kg/day to air – 0 Fraction to waste water – 1 kg/day to waste water – 200 kg Fe/day entering WWTP WWTP flow (default) – 2E+06 l/day Dilution in surface water (default) – 10</p> <p><u>Industrial use (industrial locations)</u> Fraction in formulation – 0.009</p>

	<p>Number of days – 365 Amount per day – approx. 34 kg Fe/day based on approx. 28 m³ sludge/day kg/day to air – 0 Fraction to waste water – 1 kg/day to waste water – 34 kg Fe/day entering WWTP WWTP flow (default) – 2E+06 l/day Dilution in surface water (default) – 10</p>
Risk management measures - other	<p>Any solid wastes are ultimately assumed to be disposed of via landfill or incineration. Details of the treatment of aqueous waste would vary at different sites but as a minimum the effluent treated in either in on-site or municipal secondary biological treatment plants prior to discharge.</p>
Organizational measures to prevent/limit release from site	No data
Conditions and measures related to on-site or municipal sewage treatment plant	Municipal or other type of external waste water treatment Effluent (of the waste water treatment plant) discharge rate 2000 m ³ /d.
Conditions and measures related to external treatment of waste for disposal	Any solid wastes are ultimately assumed to be disposed of via landfill or incineration.
Conditions and measures related to external recovery of waste	Not applicable

3. Control of worker exposure

	PROC 2, 5, 8a, 8b.
Product Characteristics	
Concentration of substance in mixture or articles	No data
Physical state	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered).
Amounts used	No data
Frequency and duration of use	Daily, up to 8 hours.
Human factors not influenced by risk management	<p>Body parts potentially exposed: dermal exposure, inhalation exposures. <u>Skin protection</u> protective gloves <u>Eye protection</u> safety glasses <u>Clothing</u> working clothing worn. <u>Respiratory protection</u> If handling solid salts , filter mask, in the absence of LEV.</p>
Other given operational conditions affecting workers exposure	<p>Dermal exposure is most likely to occur through accidental spillage or during formulation (transfer and charging of storage, mixing, and feed vessels) or during dosing of the waste water, where mechanical handling is not in place. <u>Dermal local exposure</u> (in µg/cm²) 400 (PROC5, in absence of LEV) <u>Dermal systemic exposure via contact with substance as such</u> (in mg/kg bw/d) 0.3 (PROC8a) <u>Dermal systemic exposure via aqueous solution</u> (in mg/kg bw/d) 0.03 (PROC8a)</p>

	<p>Inhalation exposure estimates are not performed for this exposure scenario as the iron salts are non-volatile, formulated and used in the form of solution. It is further assumed that there is no possibility of aerosol formation during the life cycle.</p> <p><u>Inhalation exposure</u> (in mg/m³)/8h workday (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts).</p> <p>a) 1.8 (PROC8a, 8b).(LEV but no PPE) b) 2.01 (PROC8a, 8b). Containment and mechanical/natural ventilation; and PPE (Filter mask P2 (FFP2)) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily.</p>
Technical conditions and measures at process level (source) to prevent release	<p>Modifications to the predicted exposures are only assumed where necessary to manage possible risks. Modifications are predominantly for use of personal protective equipment. The presence of local exhaust ventilation (LEV) is taken into account in scenarios where this is considered likely.</p>
Technical conditions and measures to control dispersion from source towards the worker	<p>Procedural and control technologies: if handling solid salts, LEV or containment and ventilation must be available.</p>
Organizational measures to prevent /limit releases, dispersion and exposure	<p>Training. Monitoring/reporting and auditing systems equipment must be well maintained and cleaned daily. Containment plus good work practice required.</p>
Conditions and measures related to personal protection, hygiene and health evaluation	<p>There is no worker exposure under normal conditions (LEV, closed process, liquid form). However there is required the use of personal protective equipment in order to minimize the risk exposure. See section 8 of the SDS.</p>

 <p>police Zakłady Chemiczne „POLICE” S.A.</p>	EXPOSURE SCENARIO ES 05	ES-05/SDS-ZChP - 013/10 version 01	
	Iron (II) sulphate	The date of:	
		compilation	revision
		09.11.2010	-

ES 05 – Use as reactive product/precursor

1. Short title of the exposure scenario:

Use as reactive product/precursor.

Sector of end use (SU):

SU3	Industrial uses: Uses of substances as such or in preparations at industrial sites
SU8	Manufacture of bulk, large scale chemicals (including petroleum products)
SU9	Manufacture of fine chemicals
SU10	Formulation [mixing] of preparations and/or repackaging (excluding alloys)
SU14	Manufacture of basic metals, including alloys

Market sector by type of chemical product (PC):

PC9a	Coatings and paints, thinners, paint removers
PC 9b	Fillers, putties, plasters, modelling clay
PC18	Ink and toners
PC19	Intermediate
PC20	Products such as ph-regulators, flocculants, precipitants, neutralization agents

List of names of contributing worker scenarios and corresponding PROCs:

PROC2	Use in closed, continuous process with occasional controlled exposure
PROC3	Use in closed batch process (synthesis or formulation)
PROC4	Use in batch and other process (synthesis) where opportunity for exposure arises
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
PROC15	Use as laboratory reagent
PROC22	Potentially closed processing operations with minerals/metals at elevated temperature. Industrial setting
PROC26	Handling of solid inorganic substances at ambient temperature

Name of contributing environmental scenario and corresponding ERC:

ERC1	Manufacture of substances
ERC4	Industrial use of processing aids in processes and products, not becoming part of articles
ERC5	Industrial use resulting in inclusion into or onto a matrix
ERC6a	Industrial use resulting in manufacture of another substance (use of intermediates)
ERC6b	Industrial use of reactive processing aids

Article category related to subsequent service life (AC):

–	Not applicable
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2. Environmental exposure controls

Product Characteristics	ERC 1, 4, 5, 6a, 6b. Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered).
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Concentration of substance in mixture or articles	No data
Amounts used	Approx. 20 tonnes iron salt per day. Used amount of substance at site per year 6000 tonnes/year.
Frequency and duration of use	Emission days per site 300 d/y.
Environmental factors not influenced by risk management	Effluent (of the waste water treatment plant) discharge rate 2000 m ³ /d.
Other given operational conditions affecting environmental exposure	<p>1. Roasting of copperas (ferrous sulfate heptahydrate) to give ferric oxide:</p> <ul style="list-style-type: none"> - Ferrous sulfate heptahydrate (copperas) may be converted to ferrous sulfate monohydrate by heating in a kiln. - The monohydrate is further heated to complete dehydration and then calcined (with loss of SO₃, which is captured and converted to sulfuric acid) to form impure ferric oxide. - This is washed to remove any soluble salts, mainly ferrous and ferric sulfates. This wash liquor is treated for disposal. It is not clear whether the dissolved salts are returned to the process or are precipitated as oxides which are landfilled. - The roasting and calcination process is continuous and enclosed. <p>2. Precipitation process</p> <ul style="list-style-type: none"> - This is a reaction between aqueous ferrous sulfate and alkali (NaOH, Ca(OH)₂, ammonia) with oxidation by air. It is carried out in a batch process, in large tanks open to the atmosphere, at moderately high temperatures (65°C-100°C). - The precipitate is collected by filtration and washed. The wash liquor primarily contains soluble non-Fe salts such as sodium sulfate. Opportunities for losses to air are nil. There is the possibility for spillage and loss to water in charging. <p>3. Preparation of iron blue (Prussian Blue)</p> <ul style="list-style-type: none"> - Precipitation in large stirred batch reactors by simultaneous or sequential addition of alkali hexacyanoferrate(II) [alkali ferrocyanide] and either solid ferrous sulfate or ferrous chloride solution to dilute acid. - This gives a white suspension which is aged by heating. This suspension is oxidised to give the characteristic blue colour by the addition of chlorate.
Technical conditions and measures at process level (source) to prevent release	The salts are used in the process “as supplied” without formulating. Three industrial processes will be considered which are representative of the overall category: one high temperature, solid-phase conversion and two solution/precipitation reactions. No consumer (or professional) use of this type is expected.
Technical on-site conditions and measures to reduce or limit discharges, air emissions and release to soil	Ferrous sulfate and chloride are freely soluble in water but aqueous solutions exposed to the air oxidise to ferric oxides and hydroxides, with the highly insoluble Fe(OH) ₃ precipitating. Thus, any release to wastewater will be converted to an insoluble precipitate at a rate dependent on factors such as the pH, concentration, and extent of exposure to air, the “parent salt” being no longer present.
Risk management measures - air	<u>Releases to air</u> The only likely source of release to air would be to dust during charging of solid salts, most especially copperas. However, in view of the low volatility of iron salts it is not envisaged that

	releases to air are realistic.
Risk management measures - water	<u>Releases to water</u> There is the possibility for spillage and loss to water in charging or through accident when using aqueous iron salts or processing waste liquor. This scenario uses: 0.5% to waste water, equivalent to 100 kg salt/d Equivalent to approx. 40 kg Fe/d.
Risk management measures - soil	Surface water (in mg/l) 2.4E-06 Freshwater sediment (in g/kg dwt) 45.0 Agricultural soil (in g/kg dwt) 50.8
Risk management measures - other	Any solid wastes are ultimately assumed to be disposed of via landfill or incineration. Details of the treatment of aqueous waste would vary at different sites but as a minimum the effluent treated in either in on-site or municipal secondary biological treatment plants prior to discharge.
Organisational measures to prevent/limit release from site	No data
Conditions and measures related to on-site or municipal sewage treatment plant	Municipal or other type of external waste water treatment Effluent (of the waste water treatment plant) discharge rate 2000 m ³ /d.
Conditions and measures related to external treatment of waste for disposal	Not applicable
Conditions and measures related to external recovery of waste	Not applicable

3. Control of worker exposure

	PROC 2, 3, 4, 8b, 9, 22, 15, 26.
Product Characteristics	
Concentration of substance in mixture or articles	No data
Physical state	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered).
Amounts used	No data
Frequency and duration of use	Daily, up to 8 hours.
Human factors not influenced by risk management	Body parts potentially exposed: dermal exposure, inhalation exposures. <u>Skin protection</u> protective gloves <u>Eye protection</u> safety glasses <u>Clothing</u> working clothing worn. <u>Respiratory protection</u> If handling solid salts , filter mask, in the absence of LEV.
Other given operational conditions affecting workers exposure	Dermal exposure is most likely to occur through accidental spillage or during transfer and charging of storage and feed vessels where mechanical handling is not in place. <u>Dermal local exposure</u> (in µg/cm ²) 200 (PROC8b, in absence of LEV) The wearing of gloves is accounted for in this value. <u>Dermal systemic exposure via contact with substance as such</u> (in mg/kg bw/d)

	<p>0.7 (PROC4) The limitation of 10% dermal uptake is assumed in deriving this value <u>Dermal systemic exposure via aqueous solution</u> (in mg/kg bw/d) 0.07 (PROC4) The limitation of <1% dermal uptake is assumed in deriving this value. Transfer and charging of solid iron salts in powder or granular form could give the potential for inhalation. Use of iron salts in solution is unlikely to give any opportunity for inhalation; chances of aerosol formation are negligible. Where spray drying of the isolated product, e.g. Iron Blue pigment, this is done after a wash step to remove soluble salts; thus, there is little likelihood of the initial iron salt, e.g., ferrous sulfate or ferrous chloride, which is soluble, being released during spray drying. <u>Inhalation exposure</u> (in mg/m³)/8h workday (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts) a) Negligible, assuming any solids are processed only in a closed system. b) 1.8 (PROC8a, 8b).(LEV but no PPE).</p>
Technical conditions and measures at process level (source) to prevent release	<p>Modifications to the predicted exposures are only assumed where necessary to manage possible risks. Modifications are predominantly for use of personal protective equipment (PPE). The presence of local exhaust ventilation (LEV) is taken into account in scenarios where this is considered likely.</p>
Technical conditions and measures to control dispersion from source towards the worker	<p>Procedural and control technologies: if handling solid salts, LEV or containment and ventilation must be available.</p>
Organizational measures to prevent /limit releases, dispersion and exposure	<p>Training. Monitoring/reporting and auditing systems :equipment must be well maintained and cleaned daily. Containment plus good work practice required.</p>
Conditions and measures related to personal protection, hygiene and health evaluation	<p>There is no worker exposure under normal conditions (LEV, closed process, liquid form). However there is required the use of personal protective equipment in order to minimize the risk exposure. See section 8 of the SDS.</p>

 police Zakłady Chemiczne „POLICE” S.A.	EXPOSURE SCENARIO ES 06	ES-06/SDS-ZChP - 013/10 version 01	
	Iron (II) sulphate	The date of:	
		compilation	revision
		09.11.2010	-

ES 06 – Manufacture of cement

1. Short title of the exposure scenario:

Manufacture of cement.

Sector of end use (SU):

SU3	Industrial uses: Uses of substances as such or in preparations at industrial sites
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SU8	Manufacture of bulk, large scale chemicals (including petroleum products)
SU13	Manufacture of other nonmetallic mineral products, e.g. plasters, cement

Market sector by type of chemical product (PC):

PC9b	Fillers, putties, plasters, modelling clay
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List of names of contributing worker scenarios and corresponding PROCs:

PROC3	Use in closed batch process (synthesis or formulation)
PROC4	Use in batch and other process (synthesis) where opportunity for exposure arises
PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities
PROC14	Production of preparations or articles by tableting, compression, extrusion, palletisation

Name of contributing environmental scenario and corresponding ERC:

ERC2	Formulation of preparations
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Article category related to subsequent service life (AC):

AC4	Stone, plaster, cement, glass and ceramic articles
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2. Environmental exposure controls


	ERC 2
Product Characteristics	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered).
Concentration of substance in mixture or articles	Not applicable
Amounts used	Used amount of substance per day 4.1 t Fe/d. Annual amount used per site approx. 1450 t Fe/y.
Frequency and duration of use	Emission days per site 350 d/y.
Environmental factors not influenced by risk management	Effluent (of the waste water treatment plant) discharge rate 2000 m ³ /d.
Other given operational conditions affecting environmental exposure	Ferrous sulfate is said to be typically dosed either in the cement grinding mill feed or alternatively as the very last step in the production process. However, another source said that ferrous sulfate cannot be added into the cement mill due to the extreme temperatures employed, ferrous sulfate being temperature

	sensitive. It describes an automated system for the dosing of ferrous sulfate into the cement as the last step prior to off-loading.
Technical conditions and measures at process level (source) to prevent release	There is a potential for airborne release of ferrous sulfate dust on charging and in preparing the mix (transfer, dosing), especially if containment is not good. If it is assumed that dust formation leads to losses of a worst case 0.02 from the manufacturing floor, of which dust control measures recapture 99.9%, and the remainder settles and is washed to drain.
Technical on-site conditions and measures to reduce or limit discharges, air emissions and release to soil	Given the extreme hazard from dust in the cement industry it may be presumed that adequate ventilation and dust capture systems are in place.
Risk management measures - air	Air (direct + STP) 0 kg/d.
Risk management measures - water	Aquatic (before WWTP) 0.08 kg/d.
Risk management measures - soil	Soil (direct releases only) 0 kg/d.
Risk management measures - other	Any solid wastes are ultimately assumed to be disposed of via landfill or incineration. Details of the treatment of aqueous waste would vary at different sites but as a minimum the effluent treated in either in on-site or municipal secondary biological treatment plants prior to discharge.
Organizational measures to prevent/limit release from site	No data
Conditions and measures related to on-site or municipal sewage treatment plant	Municipal or other type of external waste water treatment Effluent (of the waste water treatment plant) discharge rate 2000 m ³ /d.
Conditions and measures related to external treatment of waste for disposal	Not applicable
Conditions and measures related to external recovery of waste	Not applicable

3. Control of worker exposure

	PROC 3, 4, 5, 8b, 8a, 14.
Product Characteristics	
Concentration of substance in mixture or articles	No data
Physical state	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered).
Amounts used	No data
Frequency and duration of use	Daily, up to 8 hours.
Human factors not influenced by risk management	Body parts potentially exposed: dermal exposure, inhalation exposures. <u>Skin protection</u> Protective gloves <u>Eye protection</u> Safety glasses <u>Clothing</u> Working clothing worn. <u>Respiratory protection</u> If handling solid salts , Filter mask must be used , in the absence of LEV.

<p>Other given operational conditions affecting workers exposure</p>	<p>Dermal exposure is most likely to occur through accidental spillage or during transfer and charging of storage and feed vessels where mechanical handling is not in place.</p> <p><u>Dermal local exposure</u> (in $\mu\text{g}/\text{cm}^2$) 400 (PROC5, in absence of LEV) The wearing of gloves is accounted for in this value.</p> <p><u>Dermal systemic exposure via contact with substance as such</u> (in $\text{mg}/\text{kg bw}/\text{d}$) 0.7 (PROC4) The limitation of 10% dermal uptake is assumed in deriving this value.</p> <p><u>Dermal systemic exposure via aqueous solution</u> (in $\text{mg}/\text{kg bw}/\text{d}$) 0.07 (PROC4) The limitation of <1% dermal uptake is assumed in deriving this value.</p> <p>Transfer and charging of solid iron salts in powder or granular form could give the potential for inhalation.</p> <p><u>Inhalation exposure</u> (in mg/m^3)/8h workday (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts).</p> <p>a) 1.8 (PROC8a, 8b).(LEV but no PPE). b) 2.01 (PROC8a, 8b). Containment and mechanical/natural ventilation; and PPE (Filter mask P2 (FFP2)) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily.</p>
<p>Technical conditions and measures at process level (source) to prevent release</p>	<p>It is noted that the hazards associated with other constituents of cements are generally anticipated to be significantly worse than the iron salts. PPE and other risk management measures mentioned here refer only to measures necessary to manage possible risks from iron salts.</p>
<p>Technical conditions and measures to control dispersion from source towards the worker</p>	<p>Procedural and control technologies: if handling solid salts, LEV or containment and ventilation must be available.</p>
<p>Organizational measures to prevent /limit releases, dispersion and exposure</p>	<p>Training. Monitoring/reporting and auditing systems :equipment must be well maintained and cleaned daily. Containment plus good work practice required.</p>
<p>Conditions and measures related to personal protection, hygiene and health evaluation</p>	<p>There is no worker exposure under normal conditions (LEV, closed process, liquid form). However there is required the use of personal protective equipment in order to minimize the risk exposure. See section 8 of the SDS.</p>

 police Zakłady Chemiczne „POLICE” S.A.	EXPOSURE SCENARIO ES 07	ES-07/SDS-ZChP - 013/10 version 01	
	Iron (II) sulphate	The date of:	
		compilation	revision
		09.11.2010	-

ES 07 – Industrial use of cement

1. Short title of the exposure scenario:

Industrial use of cement.

Sector of end use (SU):

SU3	Industrial uses: Uses of substances as such or in preparations at industrial sites
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SU19	Building and construction work
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Market sector by type of chemical product (PC):

PC9b	Fillers, putties, plasters, modelling clay (hydraulic binder)
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List of names of contributing worker scenarios and corresponding PROCs:

PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC10	Roller application or brushing

Name of contributing environmental scenario and corresponding ERC:

ERC5	Industrial use resulting in inclusion into or onto a matrix
ERC8f	Wide dispersive outdoor use resulting in inclusion into or onto a matrix
ERC10a	Wide dispersive outdoor use of long-life articles and materials with low release

Article category related to subsequent service life (AC):

AC4	Stone, plaster, cement, glass and ceramic articles
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2. Environmental exposure controls


	ERC 5, 8f, 10a.
Product Characteristics	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered).
Concentration of substance in mixture or articles	Not applicable
Amounts used	Annual amount used per site 24 T Fe/y. Used amount of substance per day 40 tones cement mix containing 200 kg iron salt (approx. 80 kg Fe).
Frequency and duration of use	Emission days per site 300 d/y.
Environmental factors not influenced by risk management	Effluent (of the waste water treatment plant) discharge rate 2000 m ³ /d.
Other given operational conditions affecting environmental exposure	There is some possibility for exposure to dust containing ferrous sulfate in opening bags, transferring, mixing etc. the dry cement mix but once water is added there is little chance for exposure and the likelihood of loss to waste water is negligible. Any hazards to human health or the environment associated with the presence of ferrous sulfate are likely to be trivial compared with

	the hazards of soluble Cr(VI) or the alkaline nature of, or the dust hazard presented by, cement itself.
Technical conditions and measures at process level (source) to prevent release	At the end of the process, ferrous sulfate is no longer present. It is likely that exposure to the air, together with the alkaline nature of cement, results in conversion of any residual ferrous sulfate present to ferric oxides or hydroxides which are insoluble and bound into the cement matrix as it hardens.
Technical on-site conditions and measures to reduce or limit discharges, air emissions and release to soil	Usage will often be outdoors with almost all waste solids responsibly collected and disposed of via municipal facilities (i.e. to specialist landfill), with some remaining solid wastes passing to local urban/industrial soil at the site of use. It would be expected that the iron would be immobile, not able to reach surface water or the wider environment.
Risk management measures - air	Air (direct + STP) 0 kg/d.
Risk management measures - water	Aquatic (before WWTP) 0.16 kg/d.
Risk management measures - soil	Soil (direct releases only) 0 kg/d.
Risk management measures - other	Any solid wastes are ultimately assumed to be disposed of via landfill or incineration. Details of the treatment of aqueous waste would vary at different sites but as a minimum the effluent treated in either in on-site or municipal secondary biological treatment plants prior to discharge.
Organizational measures to prevent/limit release from site	No data
Conditions and measures related to on-site or municipal sewage treatment plant	Municipal or other type of external waste water treatment Effluent (of the waste water treatment plant) discharge rate 2000 m ³ /d.
Conditions and measures related to external treatment of waste for disposal	Not applicable
Conditions and measures related to external recovery of waste	Not applicable

3. Control of worker exposure

	PROC 5, 8b, 8a, 10.
Product Characteristics	
Concentration of substance in mixture or articles	No data
Physical state	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered).
Amounts used	No data
Frequency and duration of use	Daily, up to 8 hours.
Human factors not influenced by risk management	Body parts potentially exposed: dermal exposure, inhalation exposures. <u>Skin protection</u> Protective gloves <u>Eye protection</u> Safety glasses <u>Clothing</u> Working clothing worn. <u>Respiratory protection</u> If handling solid salts , Filter mask must be used , in the absence of LEV.

<p>Other given operational conditions affecting workers exposure</p>	<p>Dermal exposure is most likely to occur through accidental spillage or during transfer and charging of storage and feed vessels where mechanical handling is not in place.</p> <p><u>Dermal local exposure</u> (in $\mu\text{g}/\text{cm}^2$) 200 (PROC8b, in absence of LEV) The wearing of gloves is accounted for in this value.</p> <p><u>Dermal systemic exposure via contact with substance as such</u> (in $\text{mg}/\text{kg bw}/\text{d}$) 0.6 (PROC10) The limitation of 10% dermal uptake is assumed in deriving this value.</p> <p><u>Dermal systemic exposure via aqueous solution</u> (in $\text{mg}/\text{kg bw}/\text{d}$) 0.06 (PROC10) The limitation of <1% dermal uptake is assumed in deriving this value.</p> <p>Transfer and charging of solid iron salts in powder or granular form could give the potential for inhalation.</p> <p><u>Inhalation exposure</u> (in mg/m^3)/8h workday (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts).</p> <p>a) 1.8 (PROC8a, 8b).(LEV but no PPE). b) 2.01 (PROC8a, 8b). Containment and mechanical/natural ventilation; and PPE (Filter mask P2 (FFP2)) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily.</p>
<p>Technical conditions and measures at process level (source) to prevent release</p>	<p>It is noted that the hazards associated with other constituents of cements are generally anticipated to be significantly worse than the iron salts. PPE and other risk management measures mentioned here refer only to measures necessary to manage possible risks from iron salts.</p>
<p>Technical conditions and measures to control dispersion from source towards the worker</p>	<p>Procedural and control technologies: If handling solid salts, LEV OR containment and ventilation must be available.</p>
<p>Organizational measures to prevent /limit releases, dispersion and exposure</p>	<p>Training. Monitoring/reporting and auditing systems :equipment must be well maintained and cleaned daily. Containment plus good work practice required.</p>
<p>Conditions and measures related to personal protection, hygiene and health evaluation</p>	<p>Modifications to the predicted exposures are only assumed where necessary to manage possible risks. Modifications are predominantly for use of personal protective equipment (PPE). See section 8 of the SDS.</p>

 police Zakłady Chemiczne „POLICE” S.A.	EXPOSURE SCENARIO ES 08	ES-08/SDS-ZChP - 013/10 version 01	
	Iron (II) sulphate	The date of:	
		compilation 09.11.2010	revision -

ES 08 – Professional use of cement

1. Short title of the exposure scenario:

Professional use of cement.

Sector of end use (SU):

SU22	Professional uses: Public domain (administration, education, entertainment, services, craftsmen)
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SU13	Manufacture of other non-metallic mineral products, e.g. plasters, cement
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Market sector by type of chemical product (PC):

PC20	Products such as ph-regulators, flocculants, precipitants, neutralization agents
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List of names of contributing worker scenarios and corresponding PROCs:

PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC10	Roller application or brushing
PROC19	Hand-mixing with intimate contact and only PPE available
PROC26	Handling of solid inorganic substances at ambient temperature

Name of contributing environmental scenario and corresponding ERC:

ERC8c	Industrial use of monomers for manufacture of thermoplastics
ERC8f	Wide dispersive outdoor use resulting in inclusion into or onto a matrix
ERC10a	Wide dispersive outdoor use of long life articles and materials with low release

Article category related to subsequent service life (AC):

AC4	Stone, plaster, cement, glass and ceramic articles
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2. Environmental exposure controls


	ERC 8c, 8f, 10.
Product Characteristics	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered).
Concentration of substance in mixture or articles	Ferrous sulfate is added to cement at levels of approx.0.5%.
Amounts used	Total annual amount of substance supplied per relevant preparation category 5.1 T Fe/y.
Frequency and duration of use	Emission days per year related to that preparation category 300 d/y.
Environmental factors not influenced by risk management	Effluent (of the waste water treatment plant) discharge rate 2000 m ³ /d.
Other given operational conditions affecting environmental exposure	Professionals or consumers are highly unlikely to formulate ferrous sulfate into cement; however, cement containing ferrous sulfate may be purchased and used by anyone.

	At the end of the process, ferrous sulfate is no longer present. There is some possibility for exposure to dust containing ferrous sulfate in opening bags, transferring, mixing etc. the dry cement mix but once water is added there is little chance for exposure and the likelihood of loss to waste water is negligible.
Technical conditions and measures at process level (source) to prevent release	Scenario ES08 refers to use by tradesmen on small scale, short term projects and on small local construction work (e.g. small site construction project). Usage will often be outdoors.. It would be expected that the iron would be immobile, not able to reach surface water or the wider environment. The possibility exists that in the worst case some dusts could be washed to waste water via storm drains, and from cleaning of clothing, tools etc.
Technical on-site conditions and measures to reduce or limit discharges, air emissions and release to soil	It is anticipated that steps would be taken to avoid such losses, however to characterize the worst case it is assumed that dust formation washed to drain leads to losses of 0.02 (fraction of applied amount lost from process/use to waste water) from the sites.
Risk management measures - air	Air (direct + STP) 0 kg/d.
Risk management measures - water	Aquatic (before WWTP) 0.34 kg/d These data correspond to release to sewage.
Risk management measures - soil	Soil (direct releases only) 0 kg/d.
Risk management measures - other	For professional use, it is assumed that any unused product is disposed of as chemical waste and is not washed to drain. Equipment washing is unlikely to be carried out as standard. Spent packaging may be disposed of to landfill, recycling or by incineration.
Organizational measures to prevent/limit release from site	No data
Conditions and measures related to on-site or municipal sewage treatment plant	Municipal or other type of external waste water treatment . Effluent (of the waste water treatment plant) discharge rate 2000 m ³ /d.
Conditions and measures related to external treatment of waste for disposal	Any unused, waste dry cement mix is likely to be landfilled and, again, ferrous sulfate will be converted to insoluble ferric salts.
Conditions and measures related to external recovery of waste	Not applicable

3. Control of worker exposure

	PROC 5, 8b, 8a, 10, 19, 26.
Product Characteristics	
Concentration of substance in mixture or articles	Ferrous sulfate is added to cement at levels of approx.0.5%.
Physical state	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered).
Amounts used	Used amount of substance (as such or in preparation) per worker [workplace] per day 8.3 t cement mix containing approx 41 kg iron salt (approx. 17 kg Fe).
Frequency and duration of use	Daily, up to 8 hours.
Human factors not influenced by risk management	Body parts potentially exposed: dermal exposure, inhalation exposures.

	<p><u>Skin protection</u> Protective gloves</p> <p><u>Eye protection</u> Safety glasses</p> <p><u>Clothing</u> Working clothing worn.</p> <p><u>Respiratory protection</u> If handling solid salts , Filter mask P2 (FFP2) must be used.</p>
Other given operational conditions affecting workers exposure	<p>Dermal exposure is most likely to occur through accidental spillage or during transfer and charging of storage and feed vessels where mechanical handling is not in place.</p> <p><u>Dermal local exposure</u> (in $\mu\text{g}/\text{cm}^2$) 400 (PROC5, in absence of LEV) The wearing of gloves is accounted for in this value.</p> <p><u>Dermal systemic exposure via contact with substance as such</u> (in mg/kg bw/d) 0.27 (PROC2, 8b) The limitation of 10% dermal uptake is assumed in deriving this value.</p> <p><u>Dermal systemic exposure via aqueous solution</u> (in mg/kg bw/d) 0.027 (PROC2, 8b) The limitation of <1% dermal uptake is assumed in deriving this value.</p> <p>Transfer and charging of solid iron salts in powder or granular form could give the potential for inhalation.</p> <p><u>Inhalation exposure</u> (in mg/m^3)/8h workday (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts)</p> <p>a) 2.0 (PROC8a, 8b; handling solids indoors). Containment and mechanical/natural ventilation; and PPE (Filter mask P2 (FFP2)) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily.</p> <p>b) 2.2 (PROC8a, 8b; handling solids outdoors). mechanical/natural ventilation; and PPE (Filter mask P2 (FFP2)) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily.</p>
Technical conditions and measures at process level (source) to prevent release	<p>It is noted that the hazards associated with other constituents of cements are generally anticipated to be significantly worse than the iron salts. PPE and other risk management measures mentioned here refer only to measures necessary to manage possible risks from iron salts. In view of the other constituents of formulated cements more rigorous RMM may be necessary and/or already in place.</p>
Technical conditions and measures to control dispersion from source towards the worker	<p>Procedural and control technologies: If handling solid salts, containment and ventilation must be available.</p>
Organizational measures to prevent /limit releases, dispersion and exposure	<p>Training. Monitoring/reporting and auditing systems Equipment must be well maintained and cleaned daily. Containment plus good work practice required.</p>
Conditions and measures related to personal protection, hygiene and health evaluation	<p>Modifications to the predicted exposures are only assumed where necessary to manage possible risks. Modifications are predominantly for use of personal protective equipment (PPE). See section 8 of the SDS.</p>

 police Zakłady Chemiczne „POLICE” S.A.	EXPOSURE SCENARIO ES 09	ES-09/SDS-ZChP - 013/10 version 01	
	Iron (II) sulphate	The date of:	
		compilation 09.11.2010	revision -

ES 09 – Professional use of selected iron salts in land remediation applications

1. Short title of the exposure scenario:

Professional use of selected iron salts in land remediation applications.

Sector of end use (SU):

SU22	Professional uses: Public domain (administration, education, entertainment, services, craftsmen)
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SU19	Building and construction work
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Market sector by type of chemical product (PC):

PC9b	Fillers, putties, plasters, modelling clay (hydraulic binder)
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List of names of contributing worker scenarios and corresponding PROCs:

PROC2	Use in closed, continuous process with occasional controlled exposure
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities

Name of contributing environmental scenario and corresponding ERC:

ERC8e	Wide dispersive outdoor use of reactive substances in open systems
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Article category related to subsequent service life (AC):

AC4	Stone, plaster, cement, glass and ceramic articles
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2. Environmental exposure controls

	ERC8e
Product Characteristics	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered).
Concentration of substance in mixture or articles	Every remediation company has its own proprietary blend.
Amounts used	Annual amount used per site Approx. 100 tonnes of iron salt, containing approximately 40 tonnes Fe.
Frequency and duration of use	Emission days per site 100 d/y. Approx. 400 kg Fe/d
Environmental factors not influenced by risk management	Effluent (of the waste water treatment plant) discharge rate 2000 m ³ /d. A permanent installation WWTP processes of the order of 30 tonnes sludge/day wet weight (TGD default) alongside its other functions. A purpose made soil washing facility might be expected to operate at a higher rate, perhaps up to 80 tonnes/day wet weight. Therefore the local soil washing and decontamination might be expected to take approx. 100 days.
Other given operational conditions affecting	The ferrous sulfate is used as a catalyst in a reagent mixture for the remediation. Once the catalytic chemical reaction has

environmental exposure	occurred, the intermediate compounds formed are non-hazardous, naturally occurring substances easily oxidized to carbon dioxide and water (a complete mineralization) during subsequent sequential reactions. One example would be when ferrous sulfate is used by remediators in a neutralization process; it is done through a redox process or precipitation. This type of remediation requires the pH of the mixture to be between 5 and 9, which results in the salts precipitating out of the mixture for easy removal.
Technical conditions and measures at process level (source) to prevent release	Given the low volatility and the high water solubility of the substances, direct releases to air can be considered negligible. However this would take the form of ferric oxides/hydroxides and the original salt would no longer be present.. Waste water from the washing process would be assumed to be processed in WWTP or perhaps treated further. It is assumed that flocs would be collected for reprocessing in view of the hazardous nature of some of the contaminants for removal. Loading of additional iron into the soil may be possible if residual iron remains in treated soil.
Technical on-site conditions and measures to reduce or limit discharges, air emissions and release to soil	Iron salts are used in land remediation treatment by professionals. Disposal of waste products associated with use will be considered. The coagulation and flocculation processes result in near total conversion of the as supplied iron salts to insoluble ferric hydroxide.
Risk management measures - air	A summary of the local releases of a typical iron salt to air, waste water and industrial soil is given below. Consumption at main site – approx. 100 tonnes of iron salt, containing approximately 40 tonnes Fe. Amount to air – 0 kg Fe/day.
Risk management measures - water	Amount to waste water – Limited by water solubility of ferric iron oxide WWTP flow (default) – 2,000 m ³ /day Dilution in surface water (default) – 10 Fraction in formulation – 5E-03 in washing slurry Number of days – 100 Amount per day – Washing 80 tonnes/day wet weight approx. 400 kg Fe/day.
Risk management measures - soil	Fraction to treated soil – 20%. Amount to soil – 80 kg/day.
Risk management measures - other	Aqueous wastes would pass to municipal WWTP and be subject to secondary biological treatment. Any solid wastes are ultimately disposed of via landfill or incineration.
Organizational measures to prevent/limit release from site	No data
Conditions and measures related to on-site or municipal sewage treatment plant	Municipal or other type of external waste water treatment . Effluent (of the waste water treatment plant) discharge rate 2000 m ³ /d.
Conditions and measures related to external treatment of waste for disposal	Any solid wastes are ultimately disposed of via landfill or incineration.
Conditions and measures related to external recovery of waste	Not applicable

3. Control of worker exposure

	PROC 2, 8a, 8b.
Product Characteristics	
Concentration of substance in mixture or articles	Every remediation company has its own proprietary blend.
Physical state	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered).
Amounts used	Used amount of substance (as such or in preparation) per worker [workplace] per day Approx. 400 kg Fe/d.
Frequency and duration of use	Daily, up to 8 hours.
Human factors not influenced by risk management	Body parts potentially exposed: dermal exposure, inhalation exposures. <u>Skin protection</u> Protective gloves <u>Eye protection</u> Safety glasses <u>Clothing</u> Working clothing worn. <u>Respiratory protection</u> If handling solid salts , Filter mask P2 (FFP2) must be used.
Other given operational conditions affecting workers exposure	Dermal exposure is most likely to occur through accidental spillage or during dosing of the facility, where mechanical handling is not in place. <u>Dermal local exposure</u> (in $\mu\text{g}/\text{cm}^2$) 200 (PROC8b, in absence of LEV) The wearing of gloves is accounted for in this value. <u>Dermal systemic exposure via contact with substance as such</u> (in mg/kg bw/d) 0.27 (PROC8a) The limitation of 10% dermal uptake is assumed in deriving this value. <u>Dermal systemic exposure via aqueous solution</u> (in mg/kg bw/d) 0.027 (PROC8a) The limitation of <1% dermal uptake is assumed in deriving this value. <u>Inhalation exposure</u> (in mg/m^3)/8h workday (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts). 2.01 (PROC8a, 8b). Containment and mechanical/natural ventilation; and PPE (Filter mask P2 (FFP2)) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily.
Technical conditions and measures at process level (source) to prevent release	In addition, it is recognized that in many instances the addition of salts to digester is done via an automatic monitoring and dosing system which does not result in any likelihood for human exposure and, conversely, it may be done via non-dedicated addition points.
Technical conditions and measures to control dispersion from source towards the worker	Procedural and control technologies :if handling solid salts, containment and ventilation must be available.
Organizational measures to prevent /limit releases, dispersion and exposure	Training. Monitoring/reporting and auditing systems Equipment must be well maintained and cleaned daily. Containment plus good work practice required.
Conditions and measures related to personal protection, hygiene and health evaluation	There is no worker exposure under normal conditions (controlled process, liquid form). However there is required the use of personal protective equipment in order to minimize the risk exposure. See section 8 of the SDS.

 <p>police Zakłady Chemiczne „POLICE” S.A.</p>	EXPOSURE SCENARIO ES 10	ES-10/SDS-ZChP - 013/10 version 01	
	Iron (II) sulphate	The date of:	
		compilation	revision
		09.11.2010	-

ES 10 – Use as laboratory chemical (industrial)

1. Short title of the exposure scenario:

Use as laboratory chemical (industrial).

Sector of end use (SU):

SU3	Industrial uses: Uses of substances as such or in preparations at industrial sites
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SU24	Scientific research and development
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Market sector by type of chemical product (PC):

PC21	Laboratory chemicals
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List of names of contributing worker scenarios and corresponding PROCs:

PROC15	Use as laboratory reagent
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Name of contributing environmental scenario and corresponding ERC:

–	Not applicable
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Article category related to subsequent service life (AC):

–	Not applicable
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2. Environmental exposure controls


	Not applicable
Product Characteristics	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered).
Concentration of substance in mixture or articles	Not applicable
Amounts used	Used amount of substance per day :environmental ES not quantified. Relatively small amounts used as required. Annual amount used per site: no information.
Frequency and duration of use	Emission days per site: no information.
Environmental factors not influenced by risk management	Effluent (of the waste water treatment plant) discharge rate 2000 m ³ /d.
Other given operational conditions affecting environmental exposure	The possibility of environmental exposure associated with use as a laboratory chemical is considered to be negligible and is not considered further.
Technical conditions and measures at process level (source) to prevent release	Not applicable
Technical on-site conditions and measures to reduce or limit discharges, air emissions and release to soil	Not applicable
Risk management measures - air	Not applicable
Risk management measures - water	Not applicable

Risk management measures - soil	Not applicable
Risk management measures - other	Not applicable
Organizational measures to prevent/limit release from site	No data
Conditions and measures related to on-site or municipal sewage treatment plant	Municipal or other type of external waste water treatment. Effluent (of the waste water treatment plant) discharge rate 2000 m ³ /d.
Conditions and measures related to external treatment of waste for disposal	Any wastes are ultimately assumed to be disposed of via landfill or professional chemical waste handlers.
Conditions and measures related to external recovery of waste	Not applicable

3. Control of worker exposure

	PROC15
Product Characteristics	
Concentration of substance in mixture or articles	No data
Physical state	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered).
Amounts used	No data
Frequency and duration of use	Daily, up to 8 hours.
Human factors not influenced by risk management	<u>Skin protection</u> Protective gloves <u>Eye protection</u> Safety glasses <u>Clothing</u> Working clothing worn. <u>Respiratory protection</u> If handling solid salts , Filter mask P2 (FFP2) must be used , in the absence of LEV.
Other given operational conditions affecting workers exposure	<u>Dermal local exposure</u> (in µg/cm ²) 10 (PROC15, with LEV) The wearing of gloves is accounted for in this value <u>Dermal systemic exposure via contact with substance as such</u> (in mg/kg bw/d) 0.03 (PROC15) The limitation of 10% dermal uptake is assumed in deriving this value. <u>Dermal systemic exposure via aqueous solution</u> (in mg/kg bw/d) 0.003 (PROC15) The limitation of <1% dermal uptake is assumed in deriving this value. <u>Inhalation exposure</u> (in mg/m ³)/8h workday (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts). a) 1.8 (PROC8a, 8b).(LEV but no PPE). b) 2.01 (PROC8a, 8b). Containment and mechanical/natural ventilation; and PPE (Filter mask P2 (FFP2)) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily.
Technical conditions and measures at process level (source) to prevent release	Not applicable
Technical conditions and measures to control dispersion	Procedural and control technologies if handling solid salts, LEV or containment and ventilation must be available.

from source towards the worker	
Organizational measures to prevent /limit releases, dispersion and exposure	Training. Monitoring/reporting and auditing systems Equipment must be well maintained and cleaned daily. Containment plus good work practice required.
Conditions and measures related to personal protection, hygiene and health evaluation	Recommended: Use of personal protective equipment to minimize the risk exposure. See section 8 of the SDS. To warn the conditions of safe work.

 police Zakłady Chemiczne „POLICE” S.A.	EXPOSURE SCENARIO ES 11	ES-11/SDS-ZChP - 013/10 version 01	
	Iron (II) sulphate	The date of:	
		compilation	revision
		09.11.2010	-

ES 11 – Use as a laboratory chemical (professional)

1. Short title of the exposure scenario:

Use as a laboratory chemical (professional).

Sector of end use (SU):

SU22	Professional uses: Public domain (administration, education, entertainment, services, craftsmen)
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SU24	Scientific research and development
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Market sector by type of chemical product (PC):

PC21	Laboratory chemicals
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List of names of contributing worker scenarios and corresponding PROCs:

PROC15	Use as laboratory reagent
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Name of contributing environmental scenario and corresponding ERC:

–	Not applicable
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Article category related to subsequent service life (AC):

–	Not applicable
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2. Environmental exposure controls


	Not applicable
Product Characteristics	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered).
Concentration of substance in mixture or articles	Not applicable
Amounts used	Used amount of substance per day :environmental ES not quantified. Relatively small amounts used as required. Annual amount used per site: no information.
Frequency and duration of use	Emission days per site: no information.
Environmental factors not influenced by risk management	Effluent (of the waste water treatment plant) discharge rate 2000 m ³ /d.
Other given operational conditions affecting environmental exposure	The possibility of environmental exposure associated with use as a laboratory chemical is considered to be negligible and is not considered further.
Technical conditions and measures at process level (source) to prevent release	Not applicable
Technical on-site conditions and measures to reduce or limit discharges, air emissions and release to soil	Not applicable
Risk management measures - air	Not applicable

Risk management measures - water	Not applicable
Risk management measures - soil	Not applicable
Risk management measures - sediment	Not applicable
Organizational measures to prevent/limit release from site	No data
Conditions and measures related to on-site or municipal sewage treatment plant	Municipal or other type of external waste water treatment. Effluent (of the waste water treatment plant) discharge rate 2000 m ³ /d.
Conditions and measures related to external treatment of waste for disposal	Any wastes are ultimately assumed to be disposed of via landfill or professional chemical waste handlers.
Conditions and measures related to external recovery of waste	Not applicable

3. Control of worker exposure

	PROC 15
Product Characteristics	
Concentration of substance in mixture or articles	No data
Physical state	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered).
Amounts used	No data
Frequency and duration of use	Daily, up to 8 hours
Human factors not influenced by risk management	<u>Skin protection</u> Protective gloves <u>Eye protection</u> Safety glasses <u>Clothing</u> Working clothing worn. <u>Respiratory protection</u> If handling solid salts , Filter mask P2 (FFP2) must be used.
Other given operational conditions affecting workers exposure	<u>Dermal local exposure</u> (in µg/cm ²) 20 (PROC15, in absence of LEV) The wearing of gloves is accounted for in this value. <u>Dermal systemic exposure via contact with substance as such</u> (in mg/kg bw/d) 0.01 (PROC15) .The limitation of 10% dermal uptake is assumed in deriving this value. <u>Dermal systemic exposure via aqueous solution</u> (in mg/kg bw/d) 0.001 (PROC15) .The limitation of <1% dermal uptake is assumed in deriving this value. <u>Inhalation exposure</u> (in mg/m ³)/8h workday (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts). a) 1.8 (PROC8a, 8b).(LEV but no PPE). b) 2.01 (PROC8a, 8b). Containment and mechanical/natural ventilation; and PPE (Filter mask P2 (FFP2)) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily.
Technical conditions and measures at process level (source) to prevent release	Not applicable

Technical conditions and measures to control dispersion from source towards the worker	Procedural and control technologies If handling solid salts, LEV or containment and ventilation must be available.
Organizational measures to prevent /limit releases, dispersion and exposure	Training. Monitoring/reporting and auditing systems Equipment must be well maintained and cleaned daily. Containment plus good work practice required.
Conditions and measures related to personal protection, hygiene and health evaluation	Recommended: Use of personal protective equipment to minimize the risk exposure. See section 8 of the SDS. To warn the conditions of safe work.

 police Zakłady Chemiczne „POLICE” S.A.	EXPOSURE SCENARIO ES 12	ES-12/SDS-ZChP - 013/10 version 01	
	Iron (II) sulphate	The date of:	
		compilation 09.11.2010	revision -

ES 12 – Use in Agrochemicals (professional)

1. Short title of the exposure scenario:

Use in Agrochemicals (professional).

Sector of end use (SU):

SU22	Professional uses: Public domain (administration, education, entertainment, services, craftsmen)
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SU1	Agriculture, forestry, fishery
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Market sector by type of chemical product (PC):

PC12	Fertilizers
PC27	Plant protection products

List of names of contributing worker scenarios and corresponding PROCs:

PROC1	Use in closed process, no likelihood of exposure
PROC2	Use in closed, continuous process with occasional controlled exposure
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC11	Non industrial spraying
PROC13	Treatment of articles by dipping and pouring

Name of contributing environmental scenario and corresponding ERC:

ERC8a	Wide dispersive indoor use of processing aids in open systems
ERC8d	Wide dispersive outdoor use of processing aids in open systems

Article category related to subsequent service life (AC):

AC0	Other
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2. Environmental exposure controls


	ERC 8a, 8d
Product Characteristics	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered)
Concentration of substance in mixture or articles	Not applicable
Amounts used	Used amount of substance per day: Approx. 330 kg Fe/d in local area Annual amount used per site kg/y: 80 t agrochemical products in the local area/y, assumed to contain not more than 40 tonnes Fe.
Frequency and duration of use	Emission days per site 120 d/y.
Environmental factors not influenced by risk management	Effluent (of the waste water treatment plant) discharge rate 2000 m ³ /d.
Other given operational conditions affecting	Iron based fertilizers are only likely to be used in circumstances where the local iron levels are deficient and detrimental to plant

environmental exposure	growth. In terms of this assessment, the application level is such as to return iron levels back to at or approaching normal background levels. There is no need for further evaluation for the environment.
Technical conditions and measures at process level (source) to prevent release	The local release of iron containing fertilizer is envisaged as passing to soil only. Such products are envisaged to be granular solid formulations requiring no cleaning of equipment.
Technical on-site conditions and measures to reduce or limit discharges, air emissions and release to soil	Not applicable
Risk management measures - air	Not applicable
Risk management measures - water	Not applicable
Risk management measures - soil	Not applicable
Risk management measures - other	Not applicable
Organizational measures to prevent/limit release from site	No data
Conditions and measures related to on-site or municipal sewage treatment plant	Municipal or other type of external waste water treatment. Effluent (of the waste water treatment plant) discharge rate 2000 m ³ /d.
Conditions and measures related to external treatment of waste for disposal	A limited release to drain is assumed which is related to an assumption of equipment washing. Spent packaging may be disposed of to landfill, recycling or by incineration.
Conditions and measures related to external recovery of waste	Not applicable

3. Control of worker exposure

	PROC 1, 2, 8a, 8b, 11, 13.
Product Characteristics	
Concentration of substance in mixture or articles	No data
Physical state	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered).
Amounts used	No data
Frequency and duration of use	Daily, up to 8 hours
Human factors not influenced by risk management	<u>Skin protection</u> Protective gloves <u>Eye protection</u> Safety glasses <u>Clothing</u> Working clothing worn. <u>Respiratory protection</u> If handling solid salts , Filter mask P2 (FFP2) must be used. If spraying outdoors, Half/full face powered air respirator with TMP2 or 3 gas cartridge must be used.
Other given operational conditions affecting workers exposure	<u>Dermal local exposure</u> (in µg/cm ²) 200 (PROC8b, in absence of LEV).The wearing of gloves is accounted for in this value. Dermal systemic exposure via contact with substance as such(in mg/kg bw/d).

	<p>0.27 (PROC8a) .The limitation of 10% dermal uptake is assumed in deriving this value.</p> <p>Dermal systemic exposure via aqueous solution(in mg/kg bw/d) 0.027 (PROC8a) The limitation of <1% dermal uptake is assumed in deriving this value.</p> <p><u>Inhalation exposure</u> (in mg/m³)/8h workday (only solid products leading to evolution of dusts) 2.0 – 2.2 (PROC8a, 8b). Containment and mechanical/natural ventilation; and PPE (Filter mask P2 (FFP2)) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily.</p> <p><u>Inhalation exposure</u> (in mg/m³)/8h workday (only to spraying of liquid product) 3.3 (PROC11, spraying outdoors). Containment and ventilation; and PPE (Half/full face powered air respirator with TMP2 or 3 gas cartridge) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily. Exposure duration must be limited to 4 h/d and 3 d/w per worker.</p>
Technical conditions and measures at process level (source) to prevent release	Not applicable
Technical conditions and measures to control dispersion from source towards the worker	<p>Procedural and control technologies If handling solid salts, containment and ventilation must be available.</p> <p>If performing spraying indoors, a spraying booth with containment and LEV must be used. The exposure duration should be limited to 4 h/d.</p> <p>If spraying outdoors, containment must be used. The exposure duration should be limited to 4 h/d; 3 d/w.</p>
Organizational measures to prevent /limit releases, dispersion and exposure	Training. Monitoring/reporting and auditing systems Equipment must be well maintained and cleaned daily. Containment plus good work practice required.
Conditions and measures related to personal protection, hygiene and health evaluation	Recommended: Use of personal equipment to minimize the risk exposure. See section 8 of the SDS. If use solid and spraying substance, will be necessary conditions of safe work.

 <p>police Zakłady Chemiczne „POLICE” S.A.</p>	EXPOSURE SCENARIO ES 13	ES-13/SDS-ZChP - 013/10 version 01	
	Iron (II) sulphate	The date of:	
		compilation	revision
		09.11.2010	-

ES 13 – Adhesives Selants and Coatings (industrial)

1. Short title of the exposure scenario:

Adhesives Selants and Coatings (industrial).

Sector of end use (SU):

SU3	Industrial uses: Uses of substances as such or in preparations at industrial sites
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Market sector by type of chemical product (PC):

–	Not applicable
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List of names of contributing worker scenarios and corresponding PROCs:

PROC5	Mixing or blending in batch processes for formulation of preparations and articles (multistage and/or significant contact)
PROC7	Industrial spraying
PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
PROC10	Roller application or brushing
PROC12	Use of blowing agents in manufacture of foam
PROC13	Treatment of articles by dipping and pouring
PROC14	Production of preparations or articles by tableting, compression, extrusion, palletisation

Name of contributing environmental scenario and corresponding ERC:

ERC5	Industrial use resulting in inclusion into or onto a matrix
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Article category related to subsequent service life (AC):

AC4	Stone, plaster, cement, glass and ceramic articles
AC7	Metal articles
AC8	Paper articles
AC11	Wood articles
AC13	Plastic articles

2. Environmental exposure controls


	ERC 5
Product Characteristics	
Concentration of substance in mixture or articles	Not applicable
Amounts used	Used amount of substance per day 200 kg iron salt (approx. 80 kg Fe). Annual amount used per site kg/y 24 T Fe/y.
Frequency and duration of use	Emission days per site 300 d/y.
Environmental factors not influenced by risk management	Effluent (of the waste water treatment plant) discharge rate 2000 m ³ /d.
Other given operational	No data

conditions affecting environmental exposure	
Technical conditions and measures at process level (source) to prevent release	No data
Technical on-site conditions and measures to reduce or limit discharges, air emissions and release to soil	A summary of the local releases of ferrous sulfate to air, waste water and industrial soil is given in below.
Risk management measures - air	Air (direct + STP) 0 kg/d (local exposure estimation).
Risk management measures - water	Aquatic (before STP) 0.16 kg/d (local exposure estimation).
Risk management measures - soil	Soil (direct releases only) 0 kg/d (local exposure estimation).
Risk management measures - other	No data
Organizational measures to prevent/limit release from site	No data
Conditions and measures related to on-site or municipal sewage treatment plant	Details of the treatment of aqueous waste would vary at different sites but as a minimum the effluent treated in either in on site or municipal secondary biological treatment plants prior to discharge.
Conditions and measures related to external treatment of waste for disposal	Any solid wastes are ultimately assumed to be disposed of via landfill or incineration.
Conditions and measures related to external recovery of waste	Not applicable

3. Control of worker exposure

	PROC5, 7, 8a, 8b, 9, 10, 12, 13, 14.
Product Characteristics	
Concentration of substance in mixture or articles	No data
Physical state	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered).
Amounts used	No data
Frequency and duration of use	Daily, up to 8 hours
Human factors not influenced by risk management	<u>Skin protection</u> Protective gloves <u>Eye protection</u> Safety glasses <u>Clothing</u> Working clothing worn. <u>Respiratory protection</u> If handling solid salts , Filter mask P2 (FFP2) must be used , in the absence of LEV. If spraying outdoors, Half/full face powered air respirator with TMP2 or 3 gas cartridge must be used.
Other given operational conditions affecting workers exposure	<u>Dermal local exposure</u> (in $\mu\text{g}/\text{cm}^2$) 400 (PROC5, in absence of LEV).The wearing of gloves is accounted for in this value. Dermal systemic exposure via contact with substance as such(in mg/kg bw/d). 0.3 (PROC5, PROC8a) The limitation of 10% dermal uptake is assumed in deriving this value.

	<p>While PROC7 applies for this scenario, there would be no spraying of the substance as such.</p> <p>Dermal systemic exposure via aqueous solution(in mg/kg bw/d). 0.09 (PROC7) The limitation of <1% dermal uptake is assumed in deriving this value.</p> <p><u>Inhalation exposure</u> (in mg/m³)/8h workday (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts).</p> <p>a) 1.8 (PROC8a, 8b).(LEV but no PPE).</p> <p>b) 2.0 – 2.2 (PROC8a, 8b). Containment and mechanical/natural ventilation; and PPE (Filter mask P2 (FFP2)) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily.</p> <p><u>Inhalation exposure</u> (in mg/m³)/8h workday (refers only to any contributing tasks involving spraying of liquid product).</p> <p>3.3 (PROC11, spraying indoors). Spraying booth with containment and LEV must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily. Exposure duration must be limited to 4 h/d per worker.</p> <p>3.3 (PROC11, spraying outdoors). Containment and ventilation; and PPE (Half/full face powered air respirator with TMP2 or 3 gas cartridge) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily. Exposure duration must be limited to 4 h/d and 3 d/w per worker.</p>
Technical conditions and measures at process level (source) to prevent release	Not applicable
Technical conditions and measures to control dispersion from source towards the worker	<p>Procedural and control technologies If handling solid salts, LEV or containment and ventilation must be available.</p> <p>If performing spraying indoors, a spraying booth with containment and LEV must be used. The exposure duration should be limited to 4 h/d.</p> <p>If spraying outdoors, containment must be used. The exposure duration should be limited to 4 h/d; 3 d/w.</p>
Organizational measures to prevent /limit releases, dispersion and exposure	Training. Monitoring/reporting and auditing systems Equipment must be well maintained and cleaned daily. Containment plus good work practice required.
Conditions and measures related to personal protection, hygiene and health evaluation	Recommended: Use of personal equipment to minimize the risk exposure. See section 8 of the SDS. If use solid and spraying substance, will be necessary conditions of safe work.

 police Zakłady Chemiczne „POLICE” S.A.	EXPOSURE SCENARIO ES 14	ES-14/SDS-ZChP - 013/10 version 01	
	Iron (II) sulphate	The date of:	
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		09.11.2010	-

ES 14 – Adhesives Sealants and Coatings (professional)

1. Short title of the exposure scenario:

Adhesives Sealants and Coatings (professional).

Sector of end use (SU):

SU22	Professional uses: Public domain (administration, education, entertainment, services, craftsmen)
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Market sector by type of chemical product (PC):

–	Not applicable
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List of names of contributing worker scenarios and corresponding PROCs:

PROC8a	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at non dedicated facilities
PROC8b	Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities
PROC9	Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
PROC10	Roller application or brushing
PROC11	Non industrial spraying
PROC13	Treatment of articles by dipping and pouring
PROC19	Hand-mixing with intimate contact and only PPE available

Name of contributing environmental scenario and corresponding ERC:

ERC8c	Wide dispersive indoor use resulting in inclusion into or onto a matrix
ERC8f	Wide dispersive outdoor use resulting in inclusion into or onto a matrix

Article category related to subsequent service life (AC):

AC4	Stone, plaster, cement, glass and ceramic articles
AC7	Metal articles
AC8	Paper articles
AC11	Wood articles
AC13	Plastic articles

2. Environmental exposure controls


	ERC 8c, 8f
Product Characteristics	
Concentration of substance in mixture or articles	No data
Amounts used	Used amount of substance per day Approx 41 kg iron salt (approx. 17 kg Fe). Annual amount used per site kg/y 5.1 T Fe/y.
Frequency and duration of use	Emission days per site 300 d/y.
Environmental factors not influenced by risk management	Effluent (of the waste water treatment plant) discharge rate 2000 m ³ /d.
Other given operational conditions affecting environmental exposure	No data

Technical conditions and measures at process level (source) to prevent release	No data
Technical on-site conditions and measures to reduce or limit discharges, air emissions and release to soil	<u>Summary of environmental releases</u> Number of days 300 Amount per day 41 kg iron salt (approx.17kg Fe) Fraction to air - Amount to air 0 Fraction to waste water (prior to WWTP) 0.02 Fraction to sludge (passing to soil) - Amount to waste water 0.34 kg/d WWTP flow (default) 2E+06 l/d Dilution in surface water (default) 10
Risk management measures - air	Air (direct + STP) 0 kg/d.
Risk management measures - water	Aquatic (before WWTP) 0.34 kg/d These data correspond to release to sewage.
Risk management measures - soil	Soil (direct only) 0 kg/d.
Risk management measures - other	No data
Organisational measures to prevent/limit release from site	No data
Conditions and measures related to on-site or municipal sewage treatment plant	Effluent (of the waste water treatment plant) discharge rate 2000 m ³ /d. Municipal or other type of external waste water treatment.
Conditions and measures related to external treatment of waste for disposal	For professional use, it is assumed that any unused product is disposed of as chemical waste and is not washed to drain. Equipment washing is unlikely to be carried out as standard. Spent packaging may be disposed of to landfill, recycling or by incineration.
Conditions and measures related to external recovery of waste	Not applicable

3. Control of worker exposure

	PROC 8a, 8b, 9, 10, 11, 13, 19.
Product Characteristics	
Concentration of substance in mixture or articles	No data
Physical state	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered).
Amounts used	No data
Frequency and duration of use	Daily, up to 8 hours
Human factors not influenced by risk management	<u>Skin protection</u> Protective gloves <u>Eye protection</u> Safety glasses <u>Clothing</u> Working clothing worn. <u>Respiratory protection</u> If handling solid salts, Filter mask P2 (FFP2) must be used. If spraying outdoors, Half/full face powered air respirator with TMP2 or 3 gas cartridge must be used.
Other given operational conditions affecting workers	<u>Dermal local exposure</u> (in µg/cm ²) 200 (PROC8b, in absence of LEV) The wearing of gloves is

exposure	<p>accounted for in this value</p> <p>Dermal systemic exposure via contact with substance as such(in mg/kg bw/d). 0.27 (PROC8a) The limitation of 10% dermal uptake is assumed in deriving this value.</p> <p>Dermal systemic exposure via aqueous solution(in mg/kg bw/d). 0.03 (PROC8a) The limitation of <1% dermal uptake is assumed in deriving this value.</p> <p><u>Inhalation exposure</u> (in mg/m³)/8h workday (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts) 2.0- 2.2 (PROC8a, 8b). Containment and mechanical/natural ventilation; and PPE (Filter mask P2 (FFP2)) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily.</p> <p><u>Inhalation exposure</u> (in mg/m³)/8h workday (refers only to any contributing tasks involving spraying of liquid product). 3.3 (PROC11, spraying indoors). Spraying booth with containment and LEV must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily. Exposure duration must be limited to 4 h/d per worker. 3.3 (PROC11, spraying outdoors). Containment and ventilation; and PPE (Half/full face powered air respirator with TMP2 or 3 gas cartridge) must be used to limit exposure and manage risks. Equipment must be well maintained and cleaned daily. Exposure duration must be limited to 4 h/d and 3 d/w per worker.</p>
Technical conditions and measures at process level (source) to prevent release	Not applicable
Technical conditions and measures to control dispersion from source towards the worker	<p>Procedural and control technologies If handling solid salts, containment and ventilation must be available.</p> <p>If performing spraying indoors, a spraying booth with containment and LEV must be used. The exposure duration should be limited to 4 h/d.</p> <p>If spraying outdoors, containment must be used. The exposure duration should be limited to 4 h/d; 3 d/w.</p>
Organizational measures to prevent /limit releases, dispersion and exposure	Training. Monitoring/reporting and auditing systems. Equipment must be well maintained and cleaned daily. Containment plus good work practice required.
Conditions and measures related to personal protection, hygiene and health evaluation	Recommended: Use of personal equipment to mineralize the risk exposure. See section 8 of the SDS. If use solid and spraying substance, will be necessary conditions of safe work.

 police Zakłady Chemiczne „POLICE” S.A.	EXPOSURE SCENARIO ES 15	ES-15/SDS-ZChP - 013/10 version 01	
	Iron (II) sulphate	The date of:	
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ES 15 – Consumer use of cement

1. Short title of the exposure scenario:

Consumer use of cement.

Sector of end use (SU):

SU21	Consumer uses: Private households (= general public = consumers)
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Market sector by type of chemical product (PC):

PC9b	Fillers, putties, plasters, modeling clay
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List of names of contributing worker scenarios and corresponding PROCs:

–	Not applicable
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Name of contributing environmental scenario and corresponding ERCs:

ERC8c	Wide dispersive indoor use resulting in inclusion into or onto a matrix
ERC8f	Wide dispersive outdoor use resulting in inclusion into or onto a matrix
ERC10a	Wide dispersive outdoor use of long-life articles and materials with low release

Article category related to subsequent service life (AC):

AC4	Stone, plaster, cement, glass and ceramic articles
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2. Environmental exposure controls

	ERC 8c, 8f, 10a.
Product Characteristics	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered); Ferrous sulfate is added to cement at levels of approx.0.5%.
Concentration of substance in mixture or articles	No data
Amounts used	Used amount of substance (as such or in preparation) per worker [workplace] per day 8.3 t cement mix containing approx 41 kg iron salt (approx. 17 kg Fe).
Frequency and duration of use	Emission days per year related to that preparation category 300 d/y.
Environment factors not influenced by risk management	Effluent (of the waste water treatment plant) discharge rate 2,000 m ³ /d.
Other given operational conditions affecting environmental exposure	Professionals or consumers are highly unlikely to formulate ferrous sulfate into cement; however, cement containing ferrous sulfate may be purchased and used by anyone. At the end of the process, ferrous sulfate is no longer present. There is some possibility for exposure to dust containing ferrous sulfate in opening bags, transferring, mixing etc. the dry cement mix but once water is added there is little chance for exposure and the likelihood of loss to waste water is negligible.
Conditions and measures related to municipal sewage treatment plant	Assume standard municipal WWTP with disposal of sludge by agricultural spreading. Effluent (of the waste water treatment plant) discharge rate 2,000 m ³ /d.

Conditions and measures related to external treatment of waste for disposal	Any unused, waste dry cement mix is likely to be landfilled and, again, ferrous sulfate will be converted to insoluble ferric salts. Spent packaging may be disposed of to landfill, recycling or by incineration.
Conditions and measures related to external recovery of waste	Not applicable

3. Control of consumer exposure

Product Characteristics	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered).
Concentration of substance in mixture or articles	Ferrous sulfate is added to cement at levels of approx 0.5%.
Amounts used	MPA usage statistics suggest that sales via builders merchants and sales of cement 'products' constitute around 40% of consumption of cement.
Frequency and duration of use/exposure	Daily, Up to 8 hours.
Human factors not influenced by risk management	As necessary, consumers should be advised to avoid contact with skin/eyes and/or to use suitable protection. <u>Dermal local exposure</u> (in $\mu\text{g}/\text{cm}^2$) 250 Assuming that gloves are not worn. <u>Dermal systemic exposure</u> (in $\text{mg}/\text{kg bw}/\text{d}$) 6.8E-05 (mixing stage i.e. exposure to substance as such) ≤ 0.017 (application stage i.e. once prepared as an aqueous mix). 100% uptake assumed. The limitation of $\leq 1\%$ dermal uptake is assumed in deriving this value. <u>Inhalation exposure</u> (in $\text{mg}/\text{m}^3/\text{day}$) (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts). 1.1 (handling indoors). Mechanical/natural ventilation should be available. Assumes Exposure duration up to 2 h/d and 1 d/w. Use of a dust mask would be advisable if suitable ventilation is not available or for longer durations of activity.
Other given operational conditions affecting consumers exposure	Not applicable
Conditions and measures related to information and behavioral advice to consumers	Classification and labeling of preparations containing $\geq 10\%$ iron salt (or less, depending on what other substances are present) would require hazard communication according to the legislation.
Conditions and measures related to personal protection and hygiene	Recommended: PPE (gloves, etc).

 police Zakłady Chemiczne „POLICE” S.A.	EXPOSURE SCENARIO ES 16	ES-16/SDS-ZChP - 013/10 version 01	
	Iron (II) sulphate	The date of:	
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		09.11.2010	-

ES 16 – Use in Agrochemicals (consumer)

1. Short title of the exposure scenario:

Use in Agrochemicals (consumer)

Sector of end use (SU):

SU21	Consumer uses: Private households (= general public = consumers)
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Market sector by type of chemical product (PC):

PC12	Fertilizers
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PC27	Plant protection products
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List of names of contributing worker scenarios and corresponding PROCs:

–	Not applicable
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Name of contributing environmental scenario and corresponding ERC:

ERC8a	Wide dispersive indoor use of processing aids in open systems
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ERC8d	Wide dispersive outdoor use of processing aids in open systems
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Article category related to subsequent service life (AC):


AC0	Other
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2. Environmental exposure controls

	ERC 8a, 8d.
Product Characteristics	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered).
Concentration of substance in mixture or articles	No data
Amounts used	Usage (based on exposure via a single WWTP, i.e. equivalent to estimated total usage in a small town). Number of days = 365.
Frequency and duration of use	Emission days per site 365 d/y.
Environment factors not influenced by risk management	Effluent (of the waste water treatment plant) discharge rate 2,000 m ³ /d default.
Other given operational conditions affecting environmental exposure	Usage is likely to be characterized as small scale use in domestic gardening.
Conditions and measures related to municipal sewage treatment plant	Assume standard municipal WWTP with disposal of sludge by agricultural spreading. Effluent (of the waste water treatment plant) discharge rate 2,000 m ³ /d.
Conditions and measures related to external treatment of waste for disposal	Assume standard municipal WWTP with disposal of sludge by agricultural spreading. Effluent (of the waste water treatment plant) discharge rate 2,000 m ³ /d.
Conditions and measures related to external recovery of waste	No data

3. Control of worker exposure

Product Characteristics	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered).
Concentration of substance in mixture or articles	No data
Amounts used	No data
Frequency and duration of use/exposure	No data
Human factors not influenced by risk management	<p><u>Dermal local exposure</u> (in $\mu\text{g}/\text{cm}^2$) 1000 for consumer lawn/garden preparations. Assuming that gloves are not worn.</p> <p><u>Dermal systemic exposure via contact with substance as such:</u> (in mg/kg bw/d) a) 1.4 (in absence of gloves) b) 0.28 for consumer lawn/garden preparations. The limitation of 10% dermal uptake is assumed in deriving this value.</p> <p><u>Inhalation exposure</u> (in mg/m^3)/day (refers only to any contributing tasks involving handling of solid products leading to evolution of dusts). 1.1 (handling indoors). Mechanical/natural ventilation should be available. Assumes Exposure duration up to 2 h/d and 1 d/w Use of a dust mask would be advisable especially if suitable ventilation is not available or for longer durations of activity (refined exposure level $0.59 \text{ mg}/\text{m}^3$). 0.84 (handling outdoors). Assumes Exposure duration up to 4 h/d and 1 d/w.</p>
Other given operational conditions affecting consumers exposure	Not applicable
Conditions and measures related to information and behavioral advice to consumers	As necessary, consumers should be advised to avoid contact with skin/eyes and/or to Use suitable protection Classification and labeling of preparations containing $\geq 10\%$ iron salt (or less, depending on what other substances are present) would require hazard communication according to the legislation.
Conditions and measures related to personal protection and hygiene	Recommended: PPE (gloves, etc).

 police Zakłady Chemiczne „POLICE” S.A.	EXPOSURE SCENARIO ES 17	ES-17/SDS-ZChP - 013/10 version 01	
	Iron (II) sulphate	The date of:	
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ES 17 – Adhesives Sealants and Coatings (consumer)

1. Short title of the exposure scenario:

Adhesives Sealants and Coatings (consumer)

Sector of end use (SU):

SU21	Consumer uses: Private households (= general public = consumers)
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Market sector by type of chemical product (PC):

PC1	Adhesives, sealants
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List of names of contributing worker scenarios and corresponding PROCs:

–	Not applicable
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Name of contributing environmental scenario and corresponding ERC:

ERC8c	Wide dispersive indoor use resulting in inclusion into or onto a matrix
ERC8f	Wide dispersive outdoor use resulting in inclusion into or onto a matrix

Article category related to subsequent service life (AC):

AC4	Stone, plaster, cement, glass and ceramic articles
AC7	Metal articles
AC8	Paper articles
AC11	Wood articles
AC13	Plastic articles

2. Environmental exposure controls

	ERC 8c, 8f.
Product Characteristics	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered).
Concentration of substance in mixture or articles	No data
Amounts used	Consumption by users in a small town is expected to total approx. 900 t over a year. Usage (based on exposure via a single WWTP, i.e. equivalent to estimated total usage in a small town). Number of days = 365.
Frequency and duration of use	Emission days per site 365 d/y.
Environment factors not influenced by risk management	Effluent (of the waste water treatment plant) discharge rate 2,000 m ³ /d default.
Other given operational conditions affecting environmental exposure	Usage is likely to be characterized as small scale, short term DIY projects.
Conditions and measures related to municipal sewage treatment plant	Assume standard municipal WWTP with disposal of sludge by agricultural spreading. Effluent (of the waste water treatment plant) discharge rate 2,000 m ³ /d.
Conditions and measures related to external treatment of waste	Assume standard municipal WWTP with disposal of sludge by agricultural spreading. Effluent (of the waste water treatment

for disposal	plant) discharge rate 2,000 m ³ /d.
Conditions and measures related to external recovery of waste	No data

3. Control of worker exposure

Product Characteristics	Liquid (aqueous solution) or Solid salts (assumed to be in granular/flake form rather than powdered).
Concentration of substance in mixture or articles	No data
Amounts used	No data
Frequency and duration of use/exposure	No data
Human factors not influenced by risk management	<p><u>Dermal local exposure</u> (in µg/cm²) 1870 acute dermal load (assuming gloves not worn). Water borne paint containing ca 50% Fe salt w/w.</p> <p><u>Dermal systemic exposure</u> (in mg/kg bw/d) 0.28 mg/kg bw/d (acute) 7.8E-04 mg/kg bw/d (chronic) The limitation of ≤1% dermal uptake is assumed in deriving this value.</p> <p><u>Inhalation exposure</u> Negligible for contributing tasks that do not involve handling of solid products leading to evolution of dusts, or spraying of liquid product.</p>
Other given operational conditions affecting consumers exposure	Not applicable
Conditions and measures related to information and behavioral advice to consumers	As necessary, consumers should be advised to avoid contact with skin/eyes and/or to Use suitable protection. Classification and labeling of preparations containing ≥10% iron salt (or less, depending on what other substances are present) would require hazard communication according to the legislation.
Conditions and measures related to personal protection and hygiene	Recommended: PPE (gloves, etc).