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NOTICE : Important information

Please note that this generic exposure scenario is by no means intended to be mandatory, prescriptive or exhaustive. The content of this document is intended for guidance only and whilst the information on uses covered is provided in utmost good faith and has been based on the best information currently available, is to be relied upon at the user's own risk. Ultimately, it is for each company to assess the appropriateness and completeness of the information on a case-by case basis and decide what elements they wish to adopt or to add. In particular, the preparation and content of the e-SDS is the legal responsibility of each company for its own products placed on the market, and the user should verify, complete, correct or adapt this generic document appropriately.
No representations or warranties are made with regards to its completeness or accuracy, in particular regarding the list of uses that are covered, and no liability will be accepted by [the consortium members] for damages of any nature whatsoever resulting from the use of or reliance on the information.
The consortium members acknowledge that any activities carried out under REACH have to be carried out in full compliance with EU competition law, in particular but not limited to Articles 101 and 102 of the Treaty on the Functioning of the European Union (TFEU) as well as any applicable national laws.

SECTION 1. Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier:

Manganese hydrogen phosphate

EINECS Number: 257-147-0
CAS Number: 51349-94-1
REACH Registration number: [to be filled in by company]

Other identifiers:

1.2 Relevant identified uses of the substance or mixture and uses advised against:

Industrial / professional uses:
- Manufacture of manganese hydrogen phosphate (exposure scenario 1)
- Formulation of preparations (exposure scenario 2)
- Use of surface treatment formulations (exposure scenario 3)

Consumer uses:
No consumer uses.

No known uses advised against.

1.3 Details of the supplier of the safety data sheet:
[Insert relevant details including contact name, address, phone number, email here]

1.4 Emergency telephone number:
[Insert suitable emergency number and hours of operation]

SECTION 2. Hazards identification

2.1 Classification of the substance

2.1.1 According to Regulation (EC) No. 1272/2008 (EU CLP):

Eye Irritation 2. H319: Causes serious eye damage
STOT RE 2, Affected organ: Brain, Route of exposure: Inhalation. H373: May cause damage to brain through prolonged or repeated exposure
Aquatic Chronic 3. H412: Harmful to aquatic life with long lasting effects.

2.2 Label elements

2.2.1 According to Regulation (EC) No. 1272/2008 (EU CLP):

Name: manganese hydrogen phosphate
Index Number: Not applicable
CAS Number: 51349-94-1

Signal word: Warning

Hazard Statements:

H319: Causes serious eye irritation.

H373: May cause damage to organs <or state all organs affected, if known> through prolonged or repeated exposure <state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard>.
H412: Harmful to aquatic life with long lasting effects.

Precautionary Statements:

Prevention:

P260: Do not breathe dust/fume/gas/mist/vapours/spray.
P264: Wash... thoroughly after handling.
P273: Avoid release to the environment.

Response:

P314: Get medical advice/ attention if you feel unwell
P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337+P313: If eye irritation persists: Get medical advice/attention.

NOTE: Information in Section 2.2 MUST be consistent with the information provided on the supplier's labels. [ONLY 6 SELECTED – ENSURE CONSISTENCY BETWEEN SDS AND LABELS.]

2.3 Other hazards

The material is not considered to be PBT or vPvB.

SECTION 3. Composition / information on ingredients

3.1 Substance:

Name	EC Number	CAS Number	Typical concentration	Concentration Range
Manganese hydrogen phosphate	**257-147-0**	**51349-94-1**	**99.5% [Taken from SIP - specific company to update where necessary]**	**[to be provided by company]**

Registration Number (if available): [specific to each registrant – insert number here]
EC name: manganese hydrogen phosphate
Identification of hazardous impurities (where applicable):
All impurities > 1% are other inorganic phosphates or other related inorganic substances, similar to the Registered substance, and which do not significantly affect its toxicological and ecotoxicological properties
All hazardous impurities are < 0.1%

NOTE: The above information on impurities is company specific therefore suppliers to update where necessary and in line with the data that is provided in their joint registration dossier Section 1.2.

SECTION 4. First aid measures

4.1 Description of first aid measures

Inhalation
Do not breathe dust/spray. If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing.

Ingestion
Rinse out mouth and then drink plenty of water. Do not induce vomiting. In case of symptoms consult doctor.

Skin Contact
In case of contact with skin, rinse with plenty of soap and water. Take off contaminated clothing and shoes immediately.

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

If eye irritation persists, seek medical advice/attention.

4.2 Most important symptoms and effects, both acute and delayed

Manganese hydrogen phosphate is irritating to the eyes. Chronic manganese poisoning primarily involves the central nervous system.

4.3 Indication of any immediate medical attention and special treatment needed

In case of contact with eyes, flush with water immediately.

SECTION 5. Fire fighting measures

5.1 Extinguishing media

Suitable extinguishing media:
Manganese hydrogen phosphate is not flammable. Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

Inappropriate extinguishing media:
None identified.

5.2 Special hazards arising from the substance or mixture

Manganese/manganese oxides.

5.3 Advice for fire-fighters

In cases where dust particles of manganese hydrogen phosphate may be present respiratory ventilation is recommended. Wear appropriate eye protection. See Section 8.2.

SECTION 6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Avoid contact with eyes. Use personal protection equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and material for containment and cleaning up

Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

Refer to Section 8 for suitable PPE.
Refer to Section 13 for disposal considerations.

SECTION 7. Handling and storage

7.1 Precautions for safe handling

Technical measures: sufficient ventilation and local suction is required in accordance with the details in the annex to the SDS. Provide appropriate exhaust ventilation at places where dust is formed.
Do not eat, smoke or drink. Avoid contact with skin and eyes. Avoid formation of dust and aerosols.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. No known incompatibilities.

7.3 Specific end use(s)

See annex for details of end uses covered in the exposure scenarios and CSR. The exposure scenarios detailed in the annex represent a worst case for exposure to humans and the environment.

SECTION 8. Exposure controls / personal protection

8.1 Control parameters

Workplace exposure limits:

- General dust exposure limit: 10 mg/m3 (inhalable fraction), 3 mg/m3 (alveolic fraction). German TRGS 900 (2006).
- Long-term exposure limit: 0.5 mg/m^3 8-hr TWA. UK EH40/2005 Workplace exposure limits

[please check occupational limits for the country you supply to and insert limit here if available]

DNELS (worker): A DNEL was not derived since an IOELV value has been adopted by the European Commission (see reference below).

Systemic, long-term inhalation:

- Inhalable IOELV: 0.2 mg/m3
- respirable IOELV: 0.05 mg/m3

It is recommended that both values should be observed conjointly.
(1) ‘Recommendation from the Scientific Committee on Occupational Exposure Limits for Manganese and Inorganic Manganese Compounds’. SCOEL/SUM/127 – Adopted by the European Commission, June 2011

No hazard has been identified for acute exposure via any route and as such no DNELs have been derived.

DNELS (general population): No circumstances leading to exposure of the general population are envisaged.

PNECs:

Compartment	Value	Remarks
PNEC aqua (freshwater)	0.99 mg/L	The value used to derive the PNEC (9.9 mg/L) is the NOEC from the algal growth study on manganese hydrogen phosphate. This study is considered to be the most reliable available data (conducted under GLP and in accordance with OECD 201). The assessment factor is assigned on the basis of the availability of long-term results from three species at three trophic levels. The derived PNEC is considered to represent a realistic PNEC for the protection of the environment.
PNEC aqua (marine water)	0.198 mg/L	The value used to derive the PNEC (9.9 mg/L) is the NOEC from the algal growth study on manganese hydrogen phosphate. This study is considered to be the most reliable available data (conducted under GLP and in accordance with OECD 201). The assessment factor is assigned on the basis of the availability of long-term results from three species at three trophic levels. The derived PNEC is considered to represent a realistic PNEC for the protection of the environment.
PNEC aqua (intermittent releases)	0.099 mg/L	The value used to derive the PNEC (9.9 mg/L) is the NOEC from the algal growth study on manganese hydrogen phosphate. This study is considered to be the most reliable available data (conducted under GLP and in accordance with OECD 201). The derived PNEC is considered to represent a realistic PNEC for the protection of the environment.
PNEC STP	N/A	The NOEC for manganese hydrogen phosphate was found to be the highest concentration tested (1000 mg/L) and as such no hazard has been identified for manganese phosphates.
PNEC sediment (freshwater)	Not determined	In accordance with Annex IX of Regulation (EC) No. 1907/2006 (REACH) no assessment of toxicity to sediment organisms has been made.
PNEC sediment (marine water)	Not determined	In accordance with Annex IX of Regulation (EC) No. 1907/2006 (REACH) no assessment of toxicity to sediment organisms has been made.
PNEC soil	4.31 mg/kg soil dw	The PNEC is based on the lowest NOEC available for soil dwelling organisms. This value (431.32 mg/kg d.w) has been calculated from a NOEC of 157 mg Mn/kg d.w on the basis of a molecular weight calculation and as such the PNEC soil is applicable to the substance manganese hydrogen phosphate. The assessment factor is assigned on the basis of the availability of one long-term study.
PNEC oral	Not determined	The homeostatic mechanism operating in mammals together with the negligible potential for bioaccumulation is not likely to cause toxicity to mammals in the environment.

8.2 Exposure controls

Appropriate engineering controls: Ensure work area is well ventilated or exhausted (where appropriate and in line with the exposure scenarios). Provide eye wash station.

Respiratory protection: See annex for details of processes requiring respiratory protection. In case of insufficient ventilation, wear suitable respiratory device such as EN141 or EN405, Type A.

Skin protection: Laboratory coat or overalls and plastic or rubber boots. Store protective clothing separately.

Eye protection: Tightly sealed chemical safety goggles (compliant with EN 166:2001). Use equipment for eye protection tested and approved under appropriate government standards.

Hand protection: It is advisable to wear suitable gloves that are compliant with EN 374. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices.
Wash and dry hands.

Environmental controls: Refer to Sections 6, 7, 12 and 13 of the SDS.

SECTION 9. Physical and chemical properties

9.1 Information on basic physical and chemical properties

Property	Value	Method
Appearance; including colour and physical state	Pale pink crystalline solid	Observed during melting point study (EU Method A1) under conditions of GLP. Klimisch 2 – study performed on dimanganese phosphate-2-hydrate not anhydrous.
Odour	Odourless	Observed during melting point study (EU Method A1) under conditions of GLP. Klimisch 2 – study performed on dimanganese phosphate-2-hydrate not anhydrous.
Odour threshold	Not available	
pH	pH 2.6	As measured in the water solubility study (EU Method A.6) under conditions of GLP. Klimisch 2 – study performed on dimanganese phosphate-2-hydrate not anhydrous.
Melting point/freezing point	>450°C	EU Method A.1, under conditions of GLP, Klimisch 2 – study performed on dimanganese phosphate-2-hydrate not anhydrous.
Initial boiling point and boiling range	Not determined	According to Regulation No. 1907/2006, a study for boiling point is not required for solids which melt above 300°C
Flash point	Not determined	According to Regulation No. 1907/2006, the flash point does not need to be assessed for inorganic chemicals.
Evaporation rate	Not available	
Flammability (Solid, gas)	Not flammable	Based on prediction and use based observations
Upper/lower flammability or explosive limits	Not applicable	
Vapour pressure	Not determined	According to Regulation No. 1907/2006, a study for the vapour pressure need not be conducted if the melting point is above 300°C.
Vapour density (Air = 1)	Not applicable	
Relative density	3.054 g/cm3 at 20°C.	OECD Method 109, Klimisch 2 (not performed under GLP)
Solubility(ies)	Water: 211 g/L at 20	EU Method A.6, under GLP conditions,

	± 0.5°C (very soluble)	Klimisch 2 – study performed on dimanganese phosphate-2-hydrate not anhydrous. An assessment of the solubility of the test material over the environmentally relevant pH range of 4 to 9 was shown to have an influence on the water solubility of the test material (0.423 g/l in pH 9 buffered solution to 1.19 g/l in pH 4 buffered solution). The temperature range of 10°C to 30°C was shown not to have a significant influence on the water solubility of the test material (range 0.665 to 0.685 g/l at a nominal loading rate of 2 g/l).
Partition coefficient: N-octanol/water	Not determined	According to Regulation No. 1907/2006, the partition coefficient n-octanol/water does not need to be assessed for inorganic chemicals.
Auto-ignition temperature	No auto-ignition anticipated	Based on prediction
Decomposition temperature	Not applicable	
Viscosity	Not determined	Testing not technically possible: According to the relevant OECD guideline (OECD 114) a study cannot be conducted on a substance that is a solid at room temperature.
Explosive properties	Not considered to be explosive	Prediction – in accordance with EU Method A14
Oxidising properties	No oxidising properties	Prediction – in accordance with EU Method A17

9.2 Other information

Testing has been performed on manganese hydrogen phosphate, in accordance with Annex IX of REACH.

SECTION 10. Stability and reactivity

10.1 Reactivity

Non-reactive under recommended storage and handling conditions.

10.2 Chemical stability

Stable under recommended storage and handling conditions.

10.3 Possibility of hazardous reactions

Hazardous reactions are considered unlikely.

10.4 Conditions to avoid

None identified.

10.5 Incompatible materials

None identified.

10.6 Hazardous decomposition products

None identified.

[Companies to ensure the above is correct according to the form and nature of the substance supplied]

SECTION 11. Toxicological information

11.1 Information on toxicological effects

Toxicological endpoint	Value (including relevance to CLP criteria)	Method
Acute toxicity		
Oral	Oral; LD_{50}(rat) = >2000 mg/kg bw/day. Not classified.	OECD 420, Conducted under GLP, Klimisch 1
Dermal	No data available.	Study not considered necessary as sufficient information available to characterise acute systemic toxicity profile.
Inhalation	No acute inhalation hazard identified.	Study not performed – inhalation toxicity (STOT RE2) already identified. Long-term exposure limits are sufficiently protective.
Skin corrosion/irritation	Not irritating	OECD Guideline 439 / EU Method B.46, under conditions of GLP, Klimisch 1. Supported by *in vitro* corrosivity study (OECD 431). Result = not corrosive.
Serious eye/damage/irritation	Irritating to eyes – category 2	Rabbit, OECD 405 / EU Method B.5. Under conditions of GLP, Klimisch reliability 1. Supported by *ex-vivo* bcop study (OECD 437), Klimisch 1
Respiratory or skin sensitisation	Non - sensitiser	Mouse, OECD 429, EU Method B.42. Klimisch reliability 2; read-across from similar substance (manganese chloride). No data to suggest substance is a respiratory sensitiser.
Germ cell mutagenicity	Not considered to be mutagenic.	Key studies are submitted for the following REACH endpoints - in vitro gene mutation in bacteria (OECD 471, Klimisch 1, GLP) - in vitro cytogenicity study in mammalian cells (OECD 476, Klimisch 1, GLP) - in vitro gene mutation study in mammalian cells (OECD 473, Klimisch 1, GLP)
Carcinogenicity	Not considered to be a carcinogen.	Not required for REACH. No data to suggest likelihood of carcinogenicity.
Reproductive toxicity	Not considered to be a reproductive toxicant	No structural alerts to suggest substance is a reproductive toxicant.

STOT-single exposure – all routes	No STOT SE observed via the oral, dermal or inhalation route.	Not applicable.
STOT-Repeated exposure - all routes	STOT RE 2 Target organ: brain Route: inhalation	STOT-RE 2 is assigned on the basis of Mn^{2+}. Neurotoxicity is considered to be the leading health effect and as such an IOELV has been proposed and adopted by the European Commission. Classification is based on a large database of epidemiology and toxicology data on inorganic manganese compounds.
Aspiration hazard	No aspiration hazard identified	Not applicable.

The substance has been assessed with regards to the data requirements of Annex IX of REACH.

SECTION 12. Ecological information

12.1 Toxicity

Toxicological endpoint	Value (including relevance to CLP criteria)	Species, Method
Acute fish toxicity	LC50 (freshwater): 8.71 mg/L	Literature data, Klimisch 2. The lowest LC50 in studies performed with manganese sulphate was found to be 3.17 mg Mn/L (rainbow trout, soft water). This value was translated into a value relevant to manganese hydrogen phosphate by a molecular weight calculation resulting in an LC50 for manganese hydrogen phosphate of 8.709 mg/L.
Chronic fish toxicity	NOEC: 0.17 mg/L	Literature data, Klimisch 2 The lowest NOEC in studies performed with manganese sulphate or manganese chloride was found to be 0.06 mg Mn/L (rainbow trout). This value was translated into a value relevant to manganese hydrogen phosphate by a molecular weight calculation.
Acute invertebrate toxicity	EC50 (48hr): 15.66 mg/L	Literature data, Klimisch 2 The lowest 48 h EC50 value in the studies performed with manganese chloride was found to be 5.7 mg Mn/L (C.dubia, soft water). In the study with H.azteca a lower value of 3 mg Mn/L was recorded, however this was over a 96h time period and as such the 48 h EC50 is more relevant for classification and labelling. In addition, H.azteca are not the standard test species for this type of experiments as studies for regulatory purposes are more common performed with Daphia. Therefore the C.dubia value has been translated into a value relevant to manganese hydrogen phosphate by a molecular weight

		calculation.
Chronic invertebrate toxicity	0.055 mg/L	Literature data, Klimisch 2 The lowest NOEC in studies performed with manganese chloride was found to be 0.02 mg Mn/L. This value was translated into a value relevant to manganese hydrogen phosphate by a molecular weight calculation.
Algal growth inhibition	NOEC: 9.9 mg/L	OECD 201 / EU Method C.3, Under conditions of GLP, Klimisch 1
Activated Sludge Respiration	NOEC (3 hr): 1000 mg/L EC50 (3hr): >1000 mg/L	OECD 209, Under conditions of GLP, Klimisch 1

The substance has been assessed with regards to the data requirements of Annex IX of REACH

12.2 Persistence and degradability

Manganese hydrogen phosphate is an inorganic substance, biodegradation studies are not applicable. No further testing is deemed to be necessary.

12.3 Bioaccumulative potential

The potential for bioaccumulation is considered to be minimal.

12.4 Mobility in soil

The data on the adsorption /desorption for manganese has been taken from the publically available literature and is considered to be limited. The most relevant value for use in risk assessment is K_d= ca. 1200 ml/g. This is the lowest available value and therefore is considered to be indicative of metal that is known to partition to organic matter (soils/sediments) as opposed to remaining in the water column and as manganese hydrogen phosphate and manganese bis(dihydrogen phosphate) are both soluble they can be considered to be 'readily transformed' in the environment.

12.5 Results of PBT and vPvB assessment

According to the Guidance on Information Requirements and Chemical Safety Assessment, Chapter R.11: PBT Assessment, the PBT and vPvB criteria of Annex XIII to the regulation do not apply to inorganic substances. Therefore manganese hydrogen phosphate is not considered to require any further assessment of PBT properties.

12.6 Other adverse effects

No sediment or terrestrial toxicity data exists. Substance is not considered to be hazardous to sediment dwelling or terrestrial organisms. According to the criteria of the European classification and labelling system, the substance does not require classification as hazardous for the environment

SECTION 13. Disposal considerations

13.1 Waste treatment methods

Disposal recommendations are made based on the material as supplied. Disposal must be in accordance with current applicable laws and regulations.

Disposal of substance: Dispose of in accordance with national and local regulations for special waste via an appropriately licensed waste contractor. Do not discharge to drains or STP.

Disposal of packaging: Empty containers and clean out appropriately before reuse or disposal. Packaging may be recycled if thoroughly cleaned. Packaging that cannot be cleaned should be disposed of according to national and local regulations for special waste via an appropriately licensed waste contractor.

Regulatory disposal information:

European waste codes: Waste producers need to asses the process used when generating the waste and its contaminants in order to assign the most appropriate waste disposal code(s).

Recommended code: European waste catalogue 16 03 03 inorganic wastes containing dangerous substances

SECTION 14. Transport information

Transport classifications (ADR/RID/IMDG/IATA) are not defined in the REACH Registration Dossier for the substance. The information provided here is therefore not derived from this Dossier and is based on other information available to the Consortium Members. The Transport classifications (ADR/RID/IMDG/IATA) provided here are indicative and based on the data in the REACH dossier for the pure substance only and may not be applicable for solutions or other preparations. Please seek advice from your Dangerous Good Safety Advisor.

According to information available: UN transport classification: Not Classified (for pure substance as solid and solution in water

14.1 UN number			
	LAND (ADR/RID)	**SEA (IMDG)**	**AIR (IATA)**
14.2 UN proper shipping name			
14.3 Transport hazard class(es)			
Labels			

14.4 Packing group			
14.5 Environmental hazards			
14.6 Special precautions for user			
14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC code			

Other Information:

SECTION 15. Regulatory information

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

[COMPANY TO INCLUDE ANY INFORMATION RELEVANT TO THE COUNTRY OF PRODUCT AND/OR SUPPLY]

This safety data sheet is compliant with Regulation (EC) No 1907/2006 (REACH) (including the amendment, Regulation (EU) No 453/2010 and Regulation (EC) No. 1272/2008 (EU CLP).

15.2 Chemical Safety Assessment.

A Chemical Safety Assessment is available for manganese hydrogen phosphate.

SECTION 16. Other information

This SDS supersedes the SDS dated [TO BE COMPLETED BY COMPANY SUPPLYING SDS]

The following amendments have been made:

- SDS has been fully revised and re-written in accordance with Regulation (EU) No 453/2010 and Regulation (EC) No. 1272/2008 (EU CLP).
- Any further amendments to be detailed by supplier of SDS
- Section 2.1: Classification according to Council Directive 67/548/EEC removed in accordance with Regulation (EU) No. 453/2010

Sources of Key data used:
- Registration dossier submitted to ECHA in accordance with Regulation (EC) No. 1907/2006 and therefore a full reference list can be found in the corresponding CSR.

Abbreviations and acronyms used:

AF = Assessment factor
DNEL = Derived no effect level
EC50 = Median effect concentration
LC50 = Median lethal concentration
LD50 = Median lethal dose
LEV = Local Exhaust Ventilation
NOAEL = No observed adverse effect level
NOEC = No observed effect concentration
PBT Persistent bioaccumulative toxic
PEC = Predicted effect level
PNEC = Predicted no effect level
PRE = Personal Respiratory Equipment
OEL = Occupational Exposure Limit
SDS = Safety data sheet
STOT–SE = Specific target organ toxicity – single exposure
STOT–RE = Specific target organ toxicity – repeated exposure
STP = Sewage treatment plant
vPvB = Very persistent very bioaccumulative

Annex: Summary of relevant exposure scenarios

ES1: Manufacture of manganese hydrogen phosphate

Exposure Scenario 1: Manufacture of manganese hydrogen phosphate	
List of applicable use descriptors:	ERC 1, PROC 2, 3 , 4, 8b, 9, 26
Contributing environmental scenario: Manufacture of substances	ERC 1
Contributing worker scenario 1: Use in closed, continuous process with occasional controlled exposure	PROC 2
Contributing worker scenario 2: Use in closed batch process (synthesis or formulation)	PROC 3
Contributing worker scenario 3: Use in batch and other process (synthesis) where opportunity for exposure arises	PROC 4
Contributing worker scenario 4: Transfer of chemicals from/to vessels/ large containers at dedicated facilities	PROC 8b
Contributing worker scenario 5: Transfer of chemicals into small containers (dedicated filling line)	PROC 9
Contributing worker scenario 6: Handling of solid inorganic substances at ambient temperature	PROC 26
Manufacture of manganese hydrogen phosphate	
Explanation of technical processes and activities covered: Manganese sulphate is reacted with sodium carbonate, phosphoric acid and caustic soda in aqueous solution. The reaction product manganese orthophosphate is separated and dried.	
Control of environmental exposure during Manufacture of substances (ERC1)	
Further specifications	
Product characteristics	
Physical state of the substance when manufactured): solid	
Amounts used	
The annual amount of manganese hydrogen phosphate produced has been set at 300 tpa. Assuming the on-site risk management measures are equivalent to those detailed in this exposure scenario scaling principles can be applied to the resultant PECs for sites producing different quantities of this material.	
Frequency and duration of use	
Continuous exposure is assumed. Manufacturing processes may be operated on 365 days a year for 24 hours a day. It is assumed that workers will work 8-hr working shifts. A single worker may be exposed on 220 days per year.	
Environment factors not influenced by risk management	
The flow rate of the receiving water was the default value used in EUSES.	

Other given operational conditions affecting environmental exposure
See below.
Technical conditions and measures at process level (source) to prevent release
RMMs are employed, see below.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil
Emissions to waste water are reduced by on-site waste-water treatment. Procedures for water treatment are detailed in the Integrated Pollution Prevention and Control (IPPC); reference document on the best available techniques in the non-ferrous metal industries (EC, 2001). Treatment measures are dependent on the specific processes and metals involved but direct water emissions can usually be reduced by implementing one or more of the following: - Chemical precipitation - Sedimentation - Filtration - Electrolysis: for low metal concentrations - Reverse osmosis – for dissolved metal ions - Ion exchange – removal of heavy metals from waste water The Eurometaux spERC for the manufacture of metal compounds (1.2 v. 2.1) states that removal efficiency using one or more of the above techniques is 99% (50^{th} percentile). Emissions of particles into the atmosphere are generally considered to be low (due to the low vapour pressure for this material) however, emissions may be further reduced by implementing one of the following RMMs: - Electrostatic precipitators using wide electrode spacing: 5-15 mg/Nm^3 - Wet electrostatic precipitators: < 5 mg/Nm^3 - Cyclones, but as primary collector: < 50 mg/Nm^3 - Fabric or bag filters: highly efficient for controlling fine particulate : <5 mg/Nm^3 . Membrane filtration techniques can achieve < 1 mg/Nm^3. The Eurometaux spERC for the manufacture of metal compounds (1.2 v. 2.1) states that removal efficiency using one or more of the above techniques is 90 – 99.98%.
Organisational measures to prevent/limit release from site
Good working practice and prevention of releases of waste to floor, water and soil.
Conditions and measures related to municipal sewage treatment plant
Default conditions are assumed.
Conditions and measures related to external treatment of waste for disposal
The manufacturing process is designed in a way that waste is not expected. Most processes are performed under controlled conditions and sampling is considered to be minimal.
Conditions and measures related to external recovery of waste
Not applicable
Additional good practice advice beyond the REACH Chemical Safety Assessment (CSA) Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37(4) of REACH, thus the downstream user is not obliged to i) carry out own CSA and ii) to notify the use to the Agency, if he does not implement these measures.
If a site does not comply with the conditions stipulated in the spERC, it is recommended to monitor air and water releases and apply the metals DU scaling tool in order to perform a site-specific assessment. The tool can be downloaded from: http://www.arche-consulting.be/metal-CSA-toolbox/du-scaling-tool
Control of worker exposure during the manufacture of manganese hydrogen phosphate
Further specifications:
Product characteristics
Manganese hydrogen phosphate is a solid material.
Amounts used
The annual amount of manganese hydrogen phosphate produced has been set at 300 tpa, however this is not considered to be relevant for the human health assessment.

Frequency and duration of use
Continuous exposure is assumed. Manufacturing processes may be operated on 365 days a year for 24 hours a day. It is assumed that workers will work 8-hr working shifts. A single worker may be exposed on 220 days per year.
Human factors not influenced by risk management
An average worker is considered to weigh 70 kg.
Other given operational conditions affecting worker exposure
Manufacturing processes are performed indoors in large volume rooms. Exposure is minimised via appropriate risk management measures.
Technical conditions and measures at process level (source) to prevent release
The manufacturing process is designed so that exposure is minimised to sampling times and transfer only.
Technical conditions and measures to control dispersion from source towards the worker
Exhaust ventilation may be used for processes where solid manganese hydrogen phosphate is handled. The required efficiency is shown in the worker exposure estimation below.
Organisational measures to prevent/limit releases, dispersion and exposure
No specific organisational measures are undertaken, however the following working practices may be used to reduce exposure: - Use of automated or closed processes and minimisation of manual tasks - Minimisation of splashes and spills - Training of staff on good practice - Management measures to ensure RMMs are used correctly and remain effective - Good standards of personal hygiene
Conditions and measures related to personal protection, hygiene and health evaluation
For the production of manganese hydrogen phosphate, the following personal protection equipment are suggested: - Eye protection: wearing of eye protection is required. Goggles should be consistent with EN166 or equivalent. - LEV: in situations where fine, solid manganese hydrogen phosphate is handled LEV is required to reduce the exposure (see below). If LEV is not available personal protective equipment (RPE) should be considered.
Additional good practice advice beyond the REACH Chemical Safety Assessment (CSA) Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37(4) of REACH, thus the downstream user is not obliged to i) carry out own CSA and ii) to notify the use to the Agency, if he does not implement these measures.
See above.
Environmental exposure estimation: Manufacture of manganese hydrogen phosphate
The environmental exposure assessment has been performed in accordance with the ECHA's 'Guidance on Information Requirements and Chemical Safety Assessment, Chapter R.16 Environmental Exposure Estimation'. Up to 300 tonnes of manganese hydrogen phosphate is produced per year. ECETOC TRA Tier 1 and Tier 2 modules have been used to estimate exposure. In the first tier assessment the fraction of tonnage for the region was set at 1, which assumes a single manufacturing facility in Europe as a worst-case. The number of release days was set to the default of 20. An STP was considered to be present. Due to the conservative estimations generated from an ERC assessment in ECETOC TRA further refinement of the scenario was made using conditions detailed in the spERC 'manufacture of metal compounds' , Eurometaux 1.2v 2.1. **Risk characterisation for the aquatic compartment**

Compartment	PEC	PNEC	PEC/PNEC	Discussion
Freshwater	0.011 mg/l	0.99 mg/l	0.011	RCR < 1 Safe use demonstrated
Marine water	0.001 mg/l	0.198	5.05×10^{-3}	RCR < 1

		mg/l		Safe use demonstrated
Aquatic freshwater food chain	Not required – no bioaccumulation			
Aquatic marine water food chain	Not required – no bioaccumulation			

PECs for freshwater and marine sediment are not calculated as testing for this endpoint is not considered to be necessary for manganese hydrogen phosphate. Further, the background concentration of manganese in European environments is much higher than the PECs; mean values reported to be 716 mg/kg dw in stream sediment and 630 mg/kg dw in floodplain sediment (*Forges Geochemical Atlas of Europe, Part 1. Background Information, methodology and maps. ISBN 951-960-913-2*)
As such, the anthropogenic releases from this use are not considered to contribute significantly to sediment manganese content.

Risk characterisation for the terrestrial compartment:

Compartment	PEC	PNEC	PEC/PNEC	Discussion
Soil	0.107 mg/kg dw	4.31 mg/kg dw	0.025	RCR < 1 Safe use demonstrated

Further it should be noted that the PNEC soil values for manganese hydrogen phosphate are considerably lower than the background concentration of manganese in European environments; mean values reported to be 466 mg/kg dw in sub soil and 524 mg/kg dw in top soil (*Forges Geochemical Atlas of Europe, Part 1. Background Information, methodology and maps. ISBN 951-960-913-2*)
As such it is considered that the RCR values have little relevance in this instance.

No assessment for secondary poisoning (Exposure to man via the environment) is made as manganese is subject to homeostatic regulation and as such manganese has negligible potential for bioaccumulation is not likely to cause toxicity to mammals in the environment.

In addition no assessment of the STP is made as manganese hydrogen phosphate is not considered to be toxic to STP microorganisms.

Environment (combined for all emission sources)

The combined RCR for soil and water is 0.04, the emissions to air are not considered to contribute to environment toxicity due to the very low vapour pressure of the material. Therefore, the manufacturing of manganese hydrogen phosphate is not considered to be a risk to the environment.

Worker exposure estimation: manufacture of manganese hydrogen phosphate

The ECHA guidance on the information requirements and chemical safety assessment proposes ECETOC TRA as the preferred Tier 1 tool. However as manganese hydrogen phosphate is an inorganic it is prudent to use a model specifically designed for inorganics and metals and as such the model MEASE (ver 1.02.01, April 2010, EBRC) will be used. MEASE combines the parameters and approaches detailed in ECETOC TRA and the EASE expert system (based on the health risk assessment guidance for metals (HERAG) to produce a model suitable for inorganics and metals.

Assumptions on operational conditions are summarised in the table below and are based on a worst-case for exposure: low vapour pressure (1 x 10^{-6} Pa at 20°C), exposure duration of > 4 hours/day, no local exhaust ventilation (LEV) and no respiratory equipment. Where a process is not considered to be safe (RCR ≥1) additional RMMs such as LEV and PRE will be used to reduce the exposure and refine the RCR.
As this model is likely to produce an over-estimate of exposure, in instances where the company handling the manganese hydrogen phosphate has workplace monitoring data to show that actual exposures are not a concern it is anticipated that personal respiratory equipment and /or LEV may not be necessary.

No risk characterisation for eye irritation is required as the hazards can be controlled by correct use of the appropriate PPE.

Risk characterisation for workers during the manufacture of manganese hydrogen phosphate

PROC	LEV	Duration (hours)	PRE	Content (%)	Inhalation exposure estimate (mg/m^3)	Inhalation exposure estimate (mg Mn/m^3)	RCR	Discussion
Manufacture of solid manganese hydrogen phosphate – medium dustiness (worst-case based on granulometry)								
2	No	>4	No	>25	0.5	0.182	0.91	RCR < 1 Safe use demonstrated
	Yes (90% efficiency)	> 4	No	>25	0.005	0.002	0.01	RCR < 1 Safe use demonstrated
3	No	>4	No	>25	1	0.364	1.82	RMMs required
	Yes (90% efficiency)	> 4	No	>25	0.1	0.036	0.18	RCR < 1 Safe use demonstrated
4	No	>4	No	>25	5	1.82	9.1	RMMs required
	Yes (90% efficiency)	> 4	No	>25	0.5	0.182	0.91	RCR < 1 Safe use demonstrated
	Yes (90% efficiency)	> 4	Yes – 75% efficiency	>25	0.125	0.046	0.23	RCR < 1 Safe use demonstrated
8b	No	>4	No	>25	5	1.82	9.1	RMMs required
	Yes (95% efficiency)	> 4	No	>25	0.25	0.091	0.455	RCR < 1 Safe use demonstrated
	Yes (95% efficiency)	> 4	Yes – 75% efficiency	>25	0.063	0.023	0.115	RCR < 1 Safe use demonstrated
9	No	>4	No	>25	5	1.82	9.1	RMMs required

	Yes (90% efficiency)	> 4	No	>25	0.5	0.182	0.91	RCR < 1 Safe use demonstrated
	Yes (90% efficiency)	> 4	Yes – 75% efficiency	>25	0.125	0.046	0.23	RCR < 1 Safe use demonstrated
26	No	>4	No	>25	4	1.456	7.28	RMMs required
	Yes (82% efficiency)	> 4	No	>25	0.72	0.262	1.31	RMMs required
	Yes (82% efficiency)	> 4	Yes – 75% efficiency	>25	0.18	0.066	0.33	RCR < 1 Safe use demonstrated

Workers (overall exposure from all relevant emission and release sources)

All exposure estimates for workers are based on 8-hour time weighted averages and as such the worst-case for combined exposure can only be considered on the basis of the process for which the exposure is greatest. PROC 8b are considered to be the worst-case for exposure to solid manganese hydrogen phosphate over an 8 hour period but the risks can be adequately controlled via the use of LEV.
As manganese hydrogen phosphate is only ever used in an industrial setting it is considered that exposure is minimised and risks are managed effectively. Further consideration of combined exposures may be made on the basis of monitoring data however this is not considered to be required.

ES2: Formulation of preparations

Exposure Scenario 2: Formulation of preparations	
List of applicable use descriptors:	ERC 2, PROC 2, 3 , 4, 8b, 9, 26
Contributing environmental scenario: Formulation of preparations	ERC 2
Contributing worker scenario 1: Use in closed, continuous process with occasional controlled exposure	PROC 2
Contributing worker scenario 2: Use in closed batch process (synthesis or formulation)	PROC 3
Contributing worker scenario 3: Use in batch and other process (synthesis) where opportunity for exposure arises	PROC 4
Contributing worker scenario 4: Transfer of chemicals from/to vessels/ large containers at dedicated facilities	PROC 8b
Contributing worker scenario 5: Transfer of chemicals into small containers (dedicated filling line)	PROC 9
Contributing worker scenario 6: Handling of solid inorganic substances at ambient temperature	PROC 26
Formulation of preparations containing manganese hydrogen phosphate	

Explanation of technical processes and activities covered: Formulation mainly takes place in closed continuous processes with normal activities as described for manufacturing (i.e. loading, unloading, sampling, etc.). Open batch processes are also considered. The resultant formulations are used as coatings, surface treatment products for industrial use only.
Control of environmental exposure during formulation of manganese hydrogen phosphate (ERC2)
Further specifications
Product characteristics
Physical state of the substance: solid
Amounts used
The annual amount of manganese hydrogen phosphate produced has been set at 300 tpa. It is assumed that all of this tonnage is formulated. Assuming the on-site risk management measures are equivalent to those detailed in this exposure scenario scaling principles can be applied to the resultant PECs for sites producing different quantities of this material.
Frequency and duration of use
As a worst-case continuous exposure is assumed. Processes may be operated on 365 days a year for 24 hours a day. It is assumed that workers will work 8-hr shifts. Number of emitting days is set at 150 days/year Eurometaux spERC for the formulation of metal compounds into coatings and paints (2.2b v. 2.1).
Environment factors not influenced by risk management
The flow rate of the receiving water was the default value used for REACH (18,000m^3/day)
Other given operational conditions affecting environmental exposure
See below.
Technical conditions and measures at process level (source) to prevent release
RMMs are employed, see below.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil
The technical measures present during the formulation of products containing manganese hydrogen phosphate are likely to be similar to those used during manufacture. Emissions to waste water are reduced by on-site waste-water treatment. Procedures for water treatment are detailed in the Integrated Pollution Prevention and Control (IPPC); reference document on the best available techniques in the non-ferrous metal industries (EC, 2001). Treatment measures are dependent on the specific processes and metals involved but direct water emissions can usually be reduced by implementing one or more of the following: - Chemical precipitation - Sedimentation - Filtration - Electrolysis: for low metal concentrations - Reverse osmosis – for dissolved metal ions - Ion exchange – removal of heavy metals from waste water Emissions of particles into the atmosphere are generally considered to be low (due to the low vapour pressure for this material) however, emissions may be further reduced by implementing one of the following RMMs: - Electrostatic precipitators using wide electrode spacing: 5-15 mg/Nm^3 - Wet electrostatic precipitators: < 5 mg/Nm^3 - Cyclones, but as primary collector: < 50 mg/Nm^3 - Fabric or bag filters: highly efficient for controlling fine particulate : <5 mg/Nm^3 . Membrane filtration techniques can achieve < 1 mg/Nm^3. The Eurometaux spERC for the formulation of metal compounds into coatings and paints (2.2b v. 2.1) states that removal efficiency using one or more of the above techniques is on average 91%.
Organisational measures to prevent/limit release from site
Good working practice and prevention of releases of waste to floor, water and soil.
Conditions and measures related to municipal sewage treatment plant
Default conditions are assumed.

Conditions and measures related to external treatment of waste for disposal
The formulation process is designed in a way that waste is not expected. Most processes are performed under controlled conditions and sampling is considered to be minimal.
Conditions and measures related to external recovery of waste
Not applicable
Additional good practice advice beyond the REACH Chemical Safety Assessment (CSA) Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37(4) of REACH, thus the downstream user is not obliged to i) carry out own CSA and ii) to notify the use to the Agency, if he does not implement these measures.
If a site does not comply with the conditions stipulated in the spERC, it is recommended to monitor air and water releases and apply the metals DU scaling tool in order to perform a site-specific assessment. The tool can be downloaded from: http://www.arche-consulting.be/metal-CSA-toolbox/du-scaling-tool
Control of worker exposure during the formulation of manganese hydrogen phosphate
Further specifications:
Product characteristics
Manganese hydrogen phosphate is supplied a solid material and blended into preparations designed for surface treatment applications.
Amounts used
The annual amount of manganese hydrogen phosphate produced has been set at 300 tpa
Frequency and duration of use
Continuous exposure is assumed. Formulation processes may be operated on 365 days a year for 24 hours a day. It is assumed that workers will work 8-hr working shifts. A single worker may be exposed on 220 days per year.
Human factors not influenced by risk management
An average worker is considered to be 70 kg in weight.
Other given operational conditions affecting worker exposure
Formulation processes are performed indoors in large volume rooms. Exposure is minimised via appropriate risk management measures.
Technical conditions and measures at process level (source) to prevent release
The risks from exposure to manganese hydrogen phosphate are related to the handling of fine powders. Direct handling should be minimised.
Technical conditions and measures to control dispersion from source towards the worker
Exhaust ventilation may be used for processes where solid manganese hydrogen phosphate is handled.
Organisational measures to prevent/limit releases, dispersion and exposure
No specific organisational measures are undertaken, however the following working practices may be used to reduce exposure: - Use of automated or closed processes and minimisation of manual tasks - Minimisation of splashes and spills - Training of staff on good practice - Management measures to ensure RMMs are used correctly and remain effective - Good standards of personal hygiene
Conditions and measures related to personal protection, hygiene and health evaluation
For the formulation of solid manganese hydrogen phosphate the following personal protective equipment / risk management measures are considered to be appropriate: - Eye protection: wearing of eye protection is required. Goggles should be consistent with EN166 or equivalent - LEV: in situations where fine, solid manganese hydrogen phosphate is handled LEV is required to reduce the exposure (see below). If LEV is not available personal protective equipment (RPE) should be considered. The formation of aerosols (particle size ≤ 6 µm) should be avoided.

Additional good practice advice beyond the REACH Chemical Safety Assessment (CSA)
Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37(4) of REACH, thus the downstream user is not obliged to i) carry out own CSA and ii) to notify the use to the Agency, if he does not implement these measures.

See above.

Environmental exposure estimation: Formulation of manganese hydrogen phosphate

The environmental exposure assessment has been performed in accordance with the ECHA's 'Guidance on Information Requirements and Chemical Safety Assessment, Chapter R.16 Environmental Exposure Estimation'. Up to 300 tonnes of manganese hydrogen phosphate is produced per year and as such it is considered that all of this will be consumed in formulation. ECETOC TRA Tier 1 and Tier 2 modules have been used to estimate exposure.
In the first tier assessment the fraction of tonnage for the region was set at 1, which assumes a single manufacturing facility in Europe as a worst-case. The number of release days was set to the default of 20. An STP was considered to be present.
TIER 2 was based on the relevant spERC this is considered to be the most likely scenario.

Risk characterisation for the aquatic compartment

Compartment	PEC	PNEC	PEC/PNEC	Discussion
Freshwater	0.0035 mg/l	0.99 mg/l	3.5×10^{-3}	RCR < 1 Safe use demonstrated
Marine water	0.003 mg/l	0.198 mg/l	0.015	RCR < 1 Safe use demonstrated
Aquatic freshwater food chain	Not required – no bioaccumulation			
Aquatic marine water food chain	Not required – no bioaccumulation			

PECs for freshwater and marine sediment are not calculated as testing for this endpoint is not considered to be necessary for manganese hydrogen phosphate. Further, the background concentration of manganese in European environments is much higher than the PECs; mean values reported to be 716 mg/kg dw in stream sediment and 630 mg/kg dw in floodplain sediment (Forges Geochemical Atlas of Europe, Part 1. Background Information, methodology and maps. ISBN 951-960-913-2)
As such, the anthropogenic releases from this use are not considered to contribute significantly to sediment manganese content.Risk characterisation for the terrestrial compartment:

Compartment	PEC	PNEC	PEC/PNEC	Discussion
Soil	0.006 mg/kg dw	4.31 mg/kg dw	1.39×10^{-3}	RCR < 1 Safe use demonstrated

Further it should be noted that the PNEC soil values for manganese hydrogen phosphate are considerably lower than the background concentration of manganese in European environments; mean values reported to be 466 mg/kg dw in sub soil and 524 mg/kg dw in top soil (*Forges Geochemical Atlas of Europe, Part 1. Background Information, methodology and maps. ISBN 951-960-913-2*)
As such it is considered that the RCR values have little relevance in this instance.

No assessment for secondary poisoning (Exposure to man via the environment) is made as manganese is subject to homeostatic regulation and as such manganese has negligible potential for bioaccumulation is not likely to cause toxicity to mammals in the environment.

In addition, no assessment of the STP is made as manganese hydrogen phosphate is not considered to be toxic to STP microorganisms.

Environment (combined for all emission sources)

The combined RCR for soil and water is < 0.02, the emissions to air are not considered to contribute to environment toxicity due to the very low vapour pressure of the material. Therefore, the manufacturing of manganese hydrogen phosphate is not considered to be a risk to the environment.

Worker exposure estimation: formulation of manganese hydrogen phosphate

The ECHA guidance on the information requirements and chemical safety assessment proposes ECETOC TRA as the preferred Tier 1 tool. However as manganese hydrogen phosphate is an inorganic it is prudent to use a model specifically designed for inorganics and metals and as such the model MEASE (ver 1.02.01, April 2010, EBRC) will be used. MEASE combines the parameters and approaches detailed in ECETOC TRA and the EASE expert system (based on the health risk assessment guidance for metals (HERAG) to produce a model suitable for inorganics and metals.

Assumptions on operational conditions are summarised in the table below and are based on a worst-case for exposure: low vapour pressure (1 x 10^{-6} Pa at 20°C), exposure duration of > 4 hours/day, no local exhaust ventilation (LEV) and no respiratory equipment. Where a process is not considered to be safe (RCR ≥1) additional RMMs such as LEV and PRE will be used to reduce the exposure and refine the RCR.
As this model is likely to produce an over-estimate of exposure, in instances where the company handling the manganese hydrogen phosphate has workplace monitoring data to show that actual exposures are not a concern it is anticipated that personal respiratory equipment and /or LEV may not be necessary.

No risk characterisation for eye irritation is required as the hazards can be controlled by correct use of the appropriate PPE.

Risk characterisation for workers during the formulation of preparations containing manganese hydrogen phosphate

PROC	LEV	Duration (hours)	PRE	Content (%)	Inhalation exposure estimate (mg/m^3)	Inhalation exposure estimate (mg Mn/m^3)	RCR	Discussion
Manufacture of solid manganese hydrogen phosphate – medium dustiness (worst-case based on granulometry)								
2	No	>4	No	>25	0.5	0.182	0.91	RCR < 1 Safe use demonstrated
	Yes (90% efficiency)	> 4	No	>25	0.005	0.002	0.01	RCR < 1 Safe use demonstrated
3	No	>4	No	>25	1	0.364	1.82	RMMs required
	Yes (90% efficiency)	> 4	No	>25	0.1	0.036	0.18	RCR < 1 Safe use demonstrated
4	No	>4	No	>25	5	1.82	9.1	RMMs required

	Yes (90% efficiency)	> 4	No	>25	0.5	0.182	0.91	RCR < 1 Safe use demonstrated
	Yes (90% efficiency)	> 4	Yes – 75% efficiency	>25	0.125	0.046	0.23	RCR < 1 Safe use demonstrated
8b	No	>4	No	>25	5	1.82	9.1	RMMs required
	Yes (95% efficiency)	> 4	No	>25	0.25	0.091	0.455	RCR < 1 Safe use demonstrated
	Yes (95% efficiency)	> 4	Yes – 75% efficiency	>25	0.063	0.023	0.115	RCR < 1 Safe use demonstrated
9	No	>4	No	>25	5	1.82	9.1	RMMs required
	Yes (90% efficiency)	> 4	No	>25	0.5	0.182	0.91	RCR < 1 Safe use demonstrated
	Yes (90% efficiency)	> 4	Yes – 75% efficiency	>25	0.125	0.046	0.23	RCR < 1 Safe use demonstrated
26	No	>4	No	>25	4	1.456	7.28	RMMs required
	Yes (82% efficiency)	> 4	No	>25	0.72	0.262	1.31	RMMs required
	Yes (82% efficiency)	> 4	Yes – 75% efficiency	>25	0.18	0.066	0.33	RCR < 1 Safe use demonstrated

Workers (overall exposure from all relevant emission and release sources)

All exposure estimates for workers are based on 8-hour time weighted averages and as such the worst-case for combined exposure can only be considered on the basis of the process for which the exposure is greatest. PROC 8b are considered to be the worst-case for exposure to solid manganese hydrogen phosphate over an 8 hour period but the risks can be adequately controlled via the use of LEV. As manganese hydrogen phosphate is only ever used in an industrial setting it is considered that exposure is minimised and risks are managed effectively. Further consideration of combined exposures may be made on the basis of monitoring data however this is not considered to be required.

ES3: Use of surface treatment formulations

Exposure Scenario 3: Use of surface treatment formulations	
List of applicable use descriptors:	ERC 5; PROC 3 , 4, 7, 8a, 8b, 9, 10, 13, 15, 23, 24; PC 14 15; SU 15
Contributing environmental scenario 1: Industrial use resulting in inclusion into or onto a matrix	ERC 5
Contributing worker scenario 1: Use in closed batch process (synthesis or formulation)	PROC 3
Contributing worker scenario 2: Use in batch and other process (synthesis) where opportunity for exposure arises	PROC 4
Contributing worker scenario 3: Industrial spraying	PROC 7
Contributing worker scenario 4: Transfer of chemicals from/to vessels/ large containers at non-dedicated facilities	PROC 8a
Contributing worker scenario 5: Transfer of chemicals from/to vessels/ large containers at dedicated facilities	PROC 8b
Contributing worker scenario 6: Transfer of chemicals into small containers (dedicated filling line)	PROC 9
Contributing worker scenario 7: Roller application or brushing	PROC 10
Contributing worker scenario 8: treatment of articles by dipping and pouring	PROC 13
Contributing worker scenario 9: Use as a laboratory reagent	PROC 15
Contributing worker scenario 10: Open processing and transfer operations with minerals/metals at elevated temperature	PROC 23
Contributing worker scenario 11: High (mechanical)energy work-up of substances bound in materials and/or articles	PROC 24
Use of surface treatment formulations	
Explanation of technical processes and activities covered: Phosphate coatings are used on steel parts for corrosion resistance, lubrication, or as a foundation for subsequent coatings or paints. It serves as a conversion coating in which a dilute solution of phosphoric acid and phosphate salts is applied via spraying or immersion and chemically reacts with the surface of the part being coated to form a layer of insoluble, crystalline phosphates. Phosphate conversion coatings can also be used on aluminium, zinc, cadmium, silver and tin. The substance is delivered to plants by road trucks or rail tanks in powder form, unloaded from transport containers, transferred and stored in special storage containers at appropriate facilities. Samples of the substance may be taken after delivery and analysed for quality assurance in an on-site laboratory. The substance is transferred on demand to the mixing vessel or reactors at dedicated facilities. Surface treatment preparations are transferred on demand into the spraying facilities. The metal alkali phosphating is performed mainly in open processes by immersing the metal parts in baths or by spraying phosphate formulations onto the surfaces. On the one hand, phosphating in large companies may be performed in fully automated bathing/spraying lines, where workers are operating the process by remote control, doing regular inspection rounds and performing maintenance, repair and cleaning tasks. On the other hand, phosphating in smaller companies may be done in manual processes involving the manual mixing of solutions, degreasing of metal parts prior to coating, immersion of metal parts in the phosphating bath or spraying of solutions onto metal surfaces and drying the treated parts by wiping or blow-drying. Workers will also regularly perform cleaning and maintenance tasks.	
Control of environmental exposure during use of surface treatment formulations (ERC 5)	
Further specifications	
Product characteristics: typically manganese hydrogen phosphate is present in mixtures at >80%.	

Physical state of the substance: Supplied as a solid formulation.
Amounts used
The annual amount of manganese hydrogen phosphate produced has been set at 300 tpa. It is assumed that all of this tonnage is formulated and used in coatings (waste is not accounted for). Assuming the on-site risk management measures are equivalent to those detailed in this exposure scenario scaling principles can be applied to the resultant PECs for sites producing different quantities of this material.
Frequency and duration of use
As a worst-case continuous exposure is assumed. Processes may be operated on 365 days a year for 24 hours a day. It is assumed that workers will work 8-hr shifts. Tasks such as spraying take place over such shorter time scales, e.g 1-4 hours but may occur more frequently, i.e. twice a day.
Environment factors not influenced by risk management
The flow rate of the receiving water was the default value used for REACH (18,000m^3/day)
Other given operational conditions affecting environmental exposure
See below.
Technical conditions and measures at process level (source) to prevent release
RMMs are employed, see below.
Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil
Technical measures present during the use of manganese hydrogen phosphate containing products in an industrial environment Emissions to waste water are reduced by on-site waste-water treatment. Procedures for water treatment are detailed in the Integrated Pollution Prevention and Control (IPPC); reference document on the best available techniques in the non-ferrous metal industries (EC, 2001). Treatment measures are dependent on the specific processes and metals involved but direct water emissions can usually be reduced by implementing one or more of the following: - Chemical precipitation - Sedimentation - Filtration - Electrolysis: for low metal concentrations - Reverse osmosis – for dissolved metal ions - Ion exchange – removal of heavy metals from waste water Emissions of particles into the atmosphere are generally considered to be low (due to the low vapour pressure for this material) however, emissions may be further reduced by implementing one of the following RMMs: - Electrostatic precipitators using wide electrode spacing: 5-15 mg/Nm^3 - Wet electrostatic precipitators: < 5 mg/Nm^3 - Cyclones, but as primary collector: < 50 mg/Nm^3 - Fabric or bag filters: highly efficient for controlling fine particulate : <5 mg/Nm^3 . Membrane filtration techniques can achieve < 1 mg/Nm^3.
Organisational measures to prevent/limit release from site
Good working practice and prevention of releases of waste to floor, water and soil.
Conditions and measures related to municipal sewage treatment plant
Default conditions are assumed.
Conditions and measures related to external treatment of waste for disposal
Waste is not expected. Most processes are performed under controlled conditions and sampling is considered to be minimal.
Conditions and measures related to external recovery of waste
Not applicable
Additional good practice advice beyond the REACH Chemical Safety Assessment (CSA) Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37(4) of REACH, thus the downstream user is not obliged to i) carry out own CSA and ii) to

notify the use to the Agency, if he does not implement these measures.
If a site does not comply with the conditions specified in the exposure scenario it is recommended to monitor air and water releases and apply the metals DU scaling tool in order to perform a site-specific assessment. The tool can be downloaded from: http://www.arche-consulting.be/metal-CSA-toolbox/du-scaling-tool
Control of worker exposure during the use of surface treatment formulations
Further specifications:
Product characteristics: typically manganese hydrogen phosphate is present in preparations at 80% w/w.
Physical state of the substance: supplied as a solid preparation.
Amounts used
The annual amount of manganese hydrogen phosphate produced has been set at 300 tpa. It is assumed that all of this tonnage is formulated and used in coatings (waste is not accounted for).
Frequency and duration of use
As a worst-case continuous exposure is assumed. Processes may be operated on 365 days a year for 24 hours a day. It is assumed that workers will work 8-hr shifts. Tasks such as spraying take place over such shorter time scales, e.g. 1-4 hours but may occur more frequently, i.e. twice a day.
Human factors not influenced by risk management
The shift breathing volume during all process steps is assumed to be 10m^3/shift (8hours). A typical worker is considered to weigh 70 kg.
Other given operational conditions affecting worker exposure
Use in coating processes are performed indoors in large volume rooms. Exposure is minimised via appropriate risk management measures. Most processes are conducted under ambient temperature.
Technical conditions and measures at process level (source) to prevent release
Certain processes occurring under closed systems (e.g. reaction vessel), this is indicated by the PROC used.
Technical conditions and measures to control dispersion from source towards the worker
Exhaust ventilation may be used for processes where solid manganese hydrogen phosphate is handled. The required efficiency is shown in the worker exposure estimation below. Further technical measures are required for high exposure tasks such as spraying.
Organisational measures to prevent/limit releases, dispersion and exposure
No specific organisational measures are undertaken, however the following working practices may be used to reduce exposure: - Use of automated or closed processes and minimisation of manual tasks - Minimisation of splashes and spills - Training of staff on good practice - Management measures to ensure RMMs are used correctly and remain effective - General occupational hygiene measures are required.
Conditions and measures related to personal protection, hygiene and health evaluation
For the production of manganese hydrogen phosphate the following personal protection equipment are suggested: - Eye protection: wearing of eye protection is required. Goggles should be consistent with EN166 or equivalent. - LEV: in situations where fine, solid manganese hydrogen phosphate is handled LEV is required to reduce the exposure. Personal respiratory recommendations:

Task	RPE efficiency(assigned protection factor)
Industrial spraying (>4 hours), no LEV	APF = 10
Industrial spraying (>4 hours), with LEV	APF = 4

Industrial spraying (1-4 hours), no LEV	APF = 5
Industrial spraying (>4 hours),with LEV	APF = 4
open processing and transfer operations at elevated temperatures and high (mechanical) energy work-up of substances bound in materials and/or articles (>4 hours), no LEV	APF = 20

Selection of appropriate mask types should be made in accordance with 'BS EN 529:2005. Respiratory protective devices. Recommendations for selection, use, care and maintenance. Guidance document'. The formation of aerosols (particle size ≤ 6 µm) should be avoided.

Additional good practice advice beyond the REACH Chemical Safety Assessment (CSA)

Note: The measures reported in this section have not been taken into account in the exposure estimates related to the exposure scenario above. They are not subject to obligation laid down in Article 37(4) of REACH, thus the downstream user is not obliged to i) carry out own CSA and ii) to notify the use to the Agency, if he does not implement these measures.

See above.

Environmental exposure estimation: Use of surface treatment formulations

The environmental exposure assessment has been performed in accordance with the ECHA's 'Guidance on Information Requirements and Chemical Safety Assessment, Chapter R.16 Environmental Exposure Estimation'. Up to 300 tonnes of manganese hydrogen phosphate is produced per year and as such it is considered that all of this will be consumed in formulation. ECETOC TRA Tier 1 module has been used to estimate exposure.
In the first tier assessment the fraction of tonnage for the region was set at 1, which assumes a single manufacturing facility in Europe as a worst-case. The number of release days was set to the default of 20. An STP was considered to be present.
Exposure refined using spERC AISE 5.1.b.v1 – Industrial use of Me-salts in conversion coating – zinc, chromium, copper, manganese

Risk characterisation for the aquatic compartment

Compartment	PEC	PNEC	PEC/PNEC	Discussion
Freshwater	0.0310	0.99	0.03	RCR < 1 Safe use demonstrated
Marine water	0.0311	0.198	0.157	RCR < 1 Safe use demonstrated
Aquatic freshwater food chain	Not required – no bioaccumulation			
Aquatic marine water food chain	Not required – no bioaccumulation			

Risk characterisation for the terrestrial compartment:

The PEC was calculated to be 11.0 mg/kg dw and the PNEC was calculated to be 4.31 mg/kg dw. Ordinarily the PEC/PNEC ratio would indicate an unacceptable risk however, this is not the case as it should be noted that the PNEC soil values for manganese hydrogen phosphate are considerably lower than the background concentration of manganese in European environments; mean values reported to be 466 mg/kg dw in sub soil and 524 mg/kg dw in top soil (*Forges Geochemical Atlas of Europe, Part 1. Background Information, methodology and maps. ISBN 951-960-913-2*)
As such it is considered that the RCR values have little relevance in this instance.

Risk characterisation for the sediment compartment:

PECs for freshwater and marine sediment are not calculated as testing for this endpoint is not considered to be necessary for manganese hydrogen phosphate. Further, the background concentration of manganese in European environments is much higher than the PECs; mean values reported to be 716 mg/kg dw in stream sediment and 630 mg/kg dw in floodplain sediment (Forges Geochemical Atlas of Europe, Part 1. Background Information, methodology and maps. ISBN 951-960-913-2)
As such, the anthropogenic releases from this use are not considered to contribute significantly to sediment manganese content.
No assessment for secondary poisoning (Exposure to man via the environment) is made as manganese is subject to homeostatic regulation and as such manganese has negligible potential for bioaccumulation is not likely to cause toxicity to mammals in the environment.
In addition, no assessment of the STP is made as manganese hydrogen phosphate is not considered to be toxic to STP microorganisms.

Environment (combined for all emission sources)

A combined assessment is not considered to be necessary. The main source of emissions for manganese hydrogen phosphate for this use is via water and this has been shown to be safe.

Worker exposure estimation: use of surface treatment formulations

The ECHA guidance on the information requirements and chemical safety assessment proposes ECETOC TRA as the preferred Tier 1 tool. However as manganese hydrogen phosphate is an inorganic it is prudent to use a model specifically designed for inorganics and metals and as such the model MEASE (ver 1.02.01, April 2010, EBRC) will be used. MEASE combines the parameters and approaches detailed in ECETOC TRA and the EASE expert system (based on the health risk assessment guidance for metals (HERAG) to produce a model suitable for inorganics and metals.

Assumptions on operational conditions are summarised in the table below and are based on a worst-case for exposure: low vapour pressure (1 x 10^{-6} Pa at 20°C), exposure duration of > 4 hours/day, no local exhaust ventilation (LEV) and no respiratory equipment. Where a process is not considered to be safe (RCR ≥1) additional RMMs such as LEV and PRE will be used to reduce the exposure and refine the RCR.
As this model is likely to produce an over-estimate of exposure, in instances where the company handling the manganese hydrogen phosphate has workplace monitoring data to show that actual exposures are not a concern it is anticipated that personal respiratory equipment and /or LEV may not be necessary.

As MEASE is a TIER 1 tool which is likely to overestimate exposure from high-risk tasks such as industrial spraying, an assessment has been made using a Tier 2 tool: Advanced REACH Tool (ART):

No risk characterisation for eye irritation is required as the hazards can be controlled by correct use of the appropriate PPE.

Risk characterisation for workers during the use of surface treatment products containing manganese hydrogen phosphate – all tasks occur indoors, in an industrial setting

PROC	LEV	Duration (hours)	PRE	Content (%)	Inhalation exposure estimate (mg/m^3)	Inhalation exposure estimate (mg Mn/m3)	RCR	Discussion
3	No	>4	No	>25	1	0.364	1.82	RMMs required

	Yes (90% efficiency)	> 4	No	>25	0.1	0.036	0.18	RCR < 1 Safe use demonstrated
4	No	>4	No	>25	5	1.82	9.1	RMMs required
	Yes (90% efficiency)	> 4	No	>25	0.5	0.182	0.91	RCR < 1 Safe use demonstrated
	Yes (90% efficiency)	> 4	APF = 4	>25	0.125	0.046	0.23	RCR < 1 Safe use demonstrated
7	No	>4	No	>25	20	7.28	36.4	RMMs required
	Yes (90% efficiency)	> 4	No	>25	1	0.364	1.82	RMMs required
	Yes (90% efficiency)	> 4	Yes – 75% efficiency	>25	0.25	0.091	0.455	RCR < 1 Safe use demonstrated
7 (reduced time)	No	1-4 hours	No	>25	12	4.368	21.84	RMMs required
	95% efficiency	1-4 hours	No	>25	0.6	0.218	1.09	RMMs required
	95% efficiency	1-4 hours	APF = 4	>25	0.15	0.055	0.275	RCR < 1 Safe use demonstrated
8a	No	1-4	No	>25	5	1.82	9.1	RMMs required
	Yes (95% efficiency)	1-4	No	>25	0.5	0.182	0.91	RCR < 1 Safe use demonstrated
	Yes (95% efficiency)	1-4	(APF = 4)	>25	0.125	0.046	0.23	RCR < 1 Safe use demonstrated
8b	No	>4	No	>25	5	1.82	9.1	RMMs required

	Yes (95% efficiency)	> 4	No	>25	0.25	0.091	0.455	RCR < 1 Safe use demonstrated
	Yes (95% efficiency)	> 4	APF = 4	>25	0.063	0.023	0.115	RCR < 1 Safe use demonstrated
9	No	>4	No	>25	5	1.82	9.1	RMMs required
	Yes (90% efficiency)	> 4	No	>25	0.5	0.182	0.91	RCR < 1 Safe use demonstrated
	Yes (90% efficiency)	> 4	APF = 4	>25	0.125	0.046	0.23	RCR < 1 Safe use demonstrated
10	No	>4	No	>25	5	1.82	9.1	RMMs required
	Yes (90% efficiency)	> 4	No	>25	0.5	0.182	0.91	RCR < 1 Safe use demonstrated
	Yes (90% efficiency)	> 4	APF = 4	>25	0.125	0.046	0.23	RCR < 1 Safe use demonstrated
13	No	>4	No	>25	1	0.364	1.82	RMMs required
	Yes (90% efficiency)	> 4	No	>25	0.1	0.036	0.18	RCR < 1 Safe use demonstrated
15	No	>4	No	>25	0.05	0.018	0.00049	RCR < 1 Safe use demonstrated
26	No	>4	No	>25	4	1.456	7.28	RMMs required

	Yes (82% efficiency)	> 4	No	>25	0.72	0.262	1.31	RMMs required
	Yes (82% efficiency)	> 4	Yes – 75% efficiency	>25	0.18	0.066	0.33	RCR < 1 Safe use demonstrated

Tier 2 assessment of inhalation from spraying (ART)

Duration (hours)	LEV	Content (%)	Inhalation exposure estimate (mg/m^3)	Inhalation exposure estimate (mg Mn/m3)	RCR	Discussion
8	See above	50-90	0.14	0.051	0.0001	RCR < 1 Safe use demonstrated

Solid coatings are not considered to be dusty and as such have been modelled as 'low dustiness', see following table.

Process Category	LEV	Duration (hours)	PRE	Content (%)	Inhalation exposure estimate (mg/m^3)	Inhalation exposure estimate (mg Mn/m3)	RCR	Discussion
23- open processing and transfer operations with minerals / metals at elevated temperatures	No	>4	No	>25	2	0.728	3.64	RMMs required
	No	>4	No	>25	0.2	0.073	0.365	RCR < 1 Safe use demonstrated
	No	>4	APF=20	>25	0.1	0.036	0.18	RCR < 1 Safe use demonstrated
24 – High (mechanical) energy work-up of substances bound in materials and/or articles	No	>4	No	>25	2	0.728	3.64	RMMs required
	No	>4	No	>25	0.2	0.073	0.365	RCR < 1 Safe use demonstrated
	No	>4	APF=20	>25	0.1	0.036	0.18	RCR < 1 Safe use demonstrated

Workers (overall exposure from all relevant emission and release sources)

All exposure estimates for workers are based on 8-hour time weighted averages and as such the worst-case for combined exposure can only be considered on the basis of the process for which the exposure is greatest. The above tables clearly show that by implementing appropriate RMMs the exposure can be reduced to a safe level – therefore in each individual workplace it is important to consider which tasks will be performed by each worker and then consider if RMMs are required to address combined exposure – it is not possible to make a general assessment for all possible combinations of exposures and as such this should be assessed on a case by case basis and the above exposure estimates should be taken into consideration if no monitoring data exists.