SAFETY DATA SHEET

Opte-man Lightning (SDS + ES)

This safety data sheet complies with the requirements of:
Regulation (EC) No. 453/2010 and Regulation (EC) No. 1272/2008

SDS # : NP-0013-2-A
Revision date: 2018-07-20
Format: EU
Version 1.01

Section 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

Product Code(s) NP-0013-2-A

Product Name Opte-man Lightning (SDS + ES)

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

Recommended Use: A fertilizer with micronutrients for use in agriculture and horticulture

Restrictions on use Use as recommended by the label.

1.3. Details of the supplier of the safety data sheet

Manufacturer

FMC Agro Limited
Rectors Lane
Pentre
Flintshire
CH5 2DH
United Kingdom
Tel: + 44 (0) 1244 537370
E-mail: fmc.agro.uk@fmc.com

For further information, please contact:

Contact point

Tel: +44(0)1244 537370
Email: fmc.agro.uk@fmc.com

1.4. Emergency telephone number

Emergency telephone Tel: +44(0)1244 537370 (Office hours only)

Section 2: HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture *Regulation (EC) No 1272/2008*

Acute toxicity - Oral	Category 4
Skin corrosion/irritation	Category 1 Sub-category C
Specific target organ toxicity — repeated exposure	Category 2
Chronic aquatic toxicity	Category 3

2.2. Label elements

Hazard pictograms

Signal Word
Danger

Hazard Statements
H302 - Harmful if swallowed
H314 - Causes severe skin burns and eye damage
H373 - May cause damage to organs through prolonged or repeated exposure
H412 - Harmful to aquatic life with long lasting effects

Precautionary Statements
P260 - Do not breathe spray
P280 - Wear protective gloves/protective clothing/eye protection/face protection
P301 + P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P314 - Get medical advice/attention if you feel unwell

2.3. Other hazards
This product is not identified as a PBT/vPvB substance.

Section 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Chemical name	EC-No	CAS-No	Weight percent	Classification according to Regulation (EC) No. 1272/2008 [CLP]	REACH registration number
MANGANESE DINITRATE	233-828-8	10377-66-9	30-50	Ox. Sol. 2 (H272); Acute Tox. 4 (H302); Skin Corr. 1C (H314); STOT RE 2 (H373); Aquatic Chronic 3 (H412); (EUH071)	01-2119487993-17-0002
Nitric acid	231-714-2	7697-37-2	<1	Acute Tox. 3 (H331) Skin Corr. 1A (H314) Met. Corr. 1 (H290)	01-2119487297-23-XXXX

Section 4: FIRST AID MEASURES

4.1. Description of first aid measures

Eye Contact Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

Skin Contact Remove contaminated clothing and shoes. Do not remove clothing if adhering to skin. Rinse skin immediately with plenty of water for 15-20 minutes. Transfer to hospital if there are burns or symptoms of poisoning.

Inhalation Remove person from exposure ensuring one's own safety while doing so. If unconscious and breathing is OK, place in the recovery position. If conscious, ensure the casualty sits or lies down. If breathing becomes bubbly, have the casualty sit and provide oxygen if available. Transfer to hospital as soon as possible.

Ingestion Rinse mouth. Do NOT induce vomiting. Give 1 cup of water to drink every 10 minutes. If unconscious, check for breathing and apply artificial respiration if necessary. If

unconscious and breathing is OK, place in the recovery position. Transfer to hospital as soon as possible.

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

Most important symptoms and effects, both acute and delayed

Skin contact: Severe burns may occur. Progressive ulceration will occur if treatment is not immediate.

Eye contact: Corneal burns may occur. May cause permanent damage.

Ingestion: Corrosive burns may appear around the lips. Blood may be vomited. There may be difficulty swallowing.

Inhalation: There may be shortness of breath with a burning sensation in the throat. Exposure may cause coughing or wheezing.

Delayed / immediate effects: Immediate effects can be expected after short-term exposure.

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

Indication of immediate medical attention and special treatment needed, if necessary

Eye bathing equipment should be available on the premises.

Section 5: FIREFIGHTING MEASURES

5.1. Extinguishing media

Suitable Extinguishing Media
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Using spraywater to cool the containers.

Unsuitable extinguishing media
None known

5.2. Special hazards arising from the substance or mixture
Corrosive. Thermal decomposition can lead to release of toxic and corrosive gases/vapours.

5.3. Advice for firefighters
As in any fire, wear self-contained breathing apparatus and full protective gear. Wear protective clothing to prevent contact with skin and eyes.

Section 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

Personal Precautions
In case of spill, avoid contact. Isolate area and keep out animals and unprotected persons. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Stop leak if you can do it without risk.

.

For emergency responders
Use personal protection recommended in Section 8.

6.2. Environmental precautions
Keep people and animals away from and upwind of spill/leak. Keep material out of lakes, streams, ponds, and sewer drains. Keep out of waterways. Contain the spillage using bunding.

6.3. Methods and material for containment and cleaning up

Methods for Containment

Prevent further leakage or spillage if safe to do so. Absorb with earth, sand or other

non-combustible material and transfer to containers for later disposal.

Methods for cleaning up Clean-up should be dealt with only by qualified personnel familiar with the specific substance. Contain and collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local/national regulations (see Section 13). Prevent product from entering drains.

6.4. Reference to other sections

See section 8 for more information. See section 13 for more information.

Section 7: HANDLING AND STORAGE

7.1. Precautions for safe handling

Handling
Avoid contact with skin, eyes and clothing. Ensure adequate ventilation. Do not handle in a confined space. Avoid the formation or spread of mists in the air.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice.

7.2. Conditions for safe storage, including any incompatibilities

Storage
Protect from freezing. Store above 5°C. Store in a cool, dry area away from potential sources of heat, open flames, sunlight or other chemicals. Store in a cool dry place away from direct sunlight. Keep out of reach of children and animals. Keep away from food, drink and animal feedingstuffs.

Packageing material Must only be kept in original packaging.

7.3. Specific end use(s)

Specific Use(s)
No data available.

Risk Management Methods (RMM)
The information required is contained in this Safety Data Sheet.

Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

Chemical name	European Union	The United Kingdom	France	Spain	Germany
Nitric acid 7697-37-2	STEL 1 ppm STEL 2.6 mg/m³	STEL 1 ppm STEL 2.6 mg/m³	STEL 1 ppm STEL 2.6 mg/m³	STEL 1 ppm STEL 2.6 mg/m³	-
Chemical name	**Italy**	**Portugal**	**The Netherlands**	**Finland**	**Denmark**
Nitric acid 7697-37-2	STEL 1 ppm STEL 2.6 mg/m³	TWA 2 ppm STEL 4 ppm	STEL 1.3 mg/m³	TWA 0.5 ppm TWA 1.3 mg/m³ STEL 1 ppm STEL 2.6 mg/m³	STEL 1 ppm STEL 2.6 mg/m³
Chemical name	**Austria**	**Switzerland**	**Poland**	**Norway**	**Ireland**
Nitric acid 7697-37-2	STEL 1 ppm STEL 2.6 mg/m³	TWA 2 ppm TWA 5 mg/m³ STEL 2 ppm STEL 5 mg/m³	TWA 1.4 mg/m³ STEL 2.6 mg/m³	TWA 2 ppm TWA 5 mg/m³ STEL 4 ppm STEL 10 mg/m³	STEL 1 ppm STEL 2.6 mg/m³

Derived No Effect Level (DNEL) No information available.

Predicted No Effect Concentration (PNEC) No information available.

8.2. Exposure controls

Engineering measures Ensure adequate ventilation, especially in confined areas.

Personal protective equipment

Eye/Face Protection	Tightly fitting safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.
Hand Protection	Gloves (acid resistant). PVC gloves.
Skin and Body Protection	Wear impervious gloves and/or clothing if needed to prevent contact with the material.
Respiratory Protection	Not required under normal use.
Environmental exposure controls	No special environmental precautions required.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Physical State	Liquid
Appearance	No information available
Odour	Barely perceptible
Colour	Red brown
Odour threshold	No information available
pH	<2
Melting point/freezing point	No information available
Boiling point/boiling range	No information available
Flash point	No information available
Evaporation Rate	No information available
Flammability (solid, gas)	No information available
Flammability Limit in Air	
Upper flammability limit:	No information available
Lower flammability limit	No information available
Vapour pressure	No information available
Vapour density	No information available
Specific gravity	1.54 - 1.56
Water solubility	Soluble in water
Solubility in other solvents	No information available
Partition coefficient	No information available
Autoignition temperature	No information available
Decomposition temperature	No information available
Viscosity, kinematic	No information available
Viscosity, dynamic	No information available
Explosive properties	No information available
Oxidising properties	Non-oxidizing (by EC criteria)

9.2. Other information

Softening point	No information available
Molecular weight	No information available
VOC content (%)	No information available
Density	No information available
Bulk density	No information available
K_{st}	No information available

Section 10: STABILITY AND REACTIVITY

10.1. Reactivity

Stable under recommended storage conditions

10.2. Chemical stability

Stable under recommended storage conditions.

Explosion data

Sensitivity to Mechanical Impact No information available.
Sensitivity to Static Discharge No information available.

10.3. Possibility of hazardous reactions

Hazardous polymerisation
None under normal processing.

Hazardous reactions
None under normal processing. Decomposition may occur on exposure to conditions or materials listed below.

10.4. Conditions to avoid

Heat.

10.5. Incompatible materials

Strong oxidising agents. Strong bases.

10.6. Hazardous decomposition products

May emit toxic fumes under fire conditions.

Section 11: TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Acute toxicity

Product Information

Product is harmful by ingestion.

Product is harmful by inhalation.

This product is corrosive to living tissue.

Chemical name	LD50 Oral	LD50 Dermal	Inhalation LC50
MANGANESE DINITRATE	>300 mg/kg (rat)		
Nitric acid			= 130 mg/m³ (Rat) 4 h = 67 ppm (Rat) 4 h

Skin corrosion/irritation No information available.
Serious eye damage/eye irritation No information available.
Sensitisation No information available
Mutagenicity No information available.
Carcinogenicity No information available.

Reproductive toxicity No information available.
STOT - single exposure No information available.
STOT - repeated exposure No information available.

Symptoms Skin contact: Severe burns may occur. Progressive ulceration will occur if treatment is not immediate.

Eye contact: Corneal burns may occur. May cause permanent damage.

Ingestion: Corrosive burns may appear around the lips. Blood may be vomited. There may be difficulty swallowing.

Inhalation: There may be shortness of breath with a burning sensation in the throat. Exposure may cause coughing or wheezing.

Delayed / immediate effects: Immediate effects can be expected after short-term exposure.

Aspiration hazard No information available.

Section 12: ECOLOGICAL INFORMATION

12.1. Toxicity

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Chemical name	Toxicity to algae	Toxicity to fish	Toxicity to daphnia and other aquatic invertebrates
MANGANESE DINITRATE	Desmodesmus subspicatus: 72 ErC50 = 64.6 mg/L	Rainbow trout (Oncorhynchus mykiss): 96H LC50 = 47.2 mg/L	Daphnia magna: 48H EC50 = >100 mg/L
Nitric acid	-	96 h LC50: = 72 mg/L (Gambusia affinis)	-

12.2. Persistence and degradability

No information available.

12.3. Bioaccumulative potential

No information available.

12.4. Mobility in soil

Mobility in soil
Soluble in water.

Mobility
Soluble in water.

12.5. Results of PBT and vPvB assessment

This product is not identified as a PBT/vPvB substance.

12.6. Other adverse effects

Harmful to aquatic life

Section 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Waste from residues / unused products Transfer to a suitable container and arrange for collection by specialised disposal company. Do not contaminate ponds, waterways or ditches with chemical or used containers. Do not discharge to sewer systems.

Contaminated Packaging Clean container with water. Dispose of rinse water in accordance with local and national guidelines.

EWC Waste Disposal No	02 01 08
OTHER INFORMATION	NOTE : The user's attention is drawn to the possible existence of specific European, national or local regulations regarding disposal.

Section 14: TRANSPORT INFORMATION

IMDG/IMO

14.1 UN/ID no	UN3264
14.2 Proper Shipping Name	Corrosive liquid, acidic, inorganic, n.o.s. (manganese dinitrate)
14.3 Hazard class	8
14.4 Packing Group	III
14.5 Marine Pollutant	Not applicable
14.6 Special Provisions	Tunnel code E, Transport category 3
14.7 Transport in bulk according to Annex II of MARPOL and the IBC Code	This product is not transported in bulk containers

RID

14.1 UN/ID no	UN3264
14.2 Proper Shipping Name	Corrosive liquid, acidic, inorganic, n.o.s. (manganese dinitrate)
14.3 Hazard class	8
14.4 Packing Group	III
14.5 Environmental Hazard	Not applicable
14.6 Special Provisions	Tunnel code E, Transport category 3

ADR/RID

14.1 UN/ID no	UN3264
14.2 Proper Shipping Name	Corrosive liquid, acidic, inorganic, n.o.s. (manganese dinitrate)
14.3 Hazard class	8
14.4 Packing Group	III
14.5 Environmental Hazard	Not applicable
14.6 Special Provisions	Tunnel code E, Transport category 3

ICAO/IATA

14.1 UN/ID no	UN3264
14.2 Proper Shipping Name	Corrosive liquid, acidic, inorganic, n.o.s. (manganese dinitrate)
14.3 Hazard class	8
14.4 Packing Group	III
14.5 Environmental Hazard	Not applicable
14.6 Special Provisions	Tunnel code E, Transport category 3

Section 15: REGULATORY INFORMATION

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

European Union

Authorisations and/or restrictions on use:
This product does not contain substances subject to authorisation (Regulation (EC) No. 1907/2006 (REACH), Annex XIV)
This product does not contain substances subject to restriction (Regulation (EC) No. 1907/2006 (REACH), Annex XVII)

Persistent Organic Pollutants
Not Applicable

Ozone-depleting substances (ODS) regulation (EC) 1005/2009

Not Applicable

International Inventories

Chemical name	TSCA (United States)	DSL (Canada)	EINECS/ELINCS (Europe)	ENCS (Japan)	China (IECSC)	KECL (Korea)	PICCS (Philippines)	AICS (Australia)
MANGANESE DINITRATE 10377-66-9	X	X	X	X	X	X	X	X
Nitric acid 7697-37-2	X	X	X	X	X	X	X	X

15.2. Chemical safety assessment

A Chemical Safety Assessment has not yet been completed for this substance

Section 16: OTHER INFORMATION

Key or legend to abbreviations and acronyms used in the safety data sheet

Full text of R-phrases referred to under sections 2 and 3
Not applicable

Full text of H-Statements referred to under sections 2 and 3
EUH071 - Corrosive to the respiratory tract
H272 - May intensify fire; oxidiser
H302 - Harmful if swallowed
H314 - Causes severe skin burns and eye damage
H373 - May cause damage to organs through prolonged or repeated exposure
H412 - Harmful to aquatic life with long lasting effects

Legend

ADR:	European Agreement concerning the International Carriage of Dangerous Goods by Road
CAS:	CAS (Chemical Abstracts Service)
Ceiling:	Maximum limit value:
DNEL:	Derived No Effect Level (DNEL)
EINECS:	EINECS (European Inventory of Existing Chemical Substances)
GHS:	Globally Harmonised System (GHS)
IATA:	International Air Transport Association (IATA)
ICAO:	International Civil Aviation Organization
IMDG:	International Maritime Dangerous Goods (IMDG)
LC50:	LC50 (lethal concentration)
LD50:	LD50 (lethal dose)
PBT:	Persistent, Bioaccumulative, and Toxic (PBT) Chemicals
RID:	Regulations Concerning the International Transport of Dangerous Goods by Rail
STEL:	Short term exposure limit
SVHC	SVHC: Substances of Very High Concern for Authorisation:
TWA:	time weighted average
vPvB:	very Persistent and very Bioaccumulative
Revision date:	2018-07-20
Reason for revision:	(M)SDS sections updated.

Disclaimer
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. This company shall not be held liable for any damage resulting from handling or from contact with the above product.

Prepared By

FMC Corporation

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End of Safety Data Sheet

EXPOSURE SCENARIO FOR COMMUNICATION

Substance Name: Manganese Dinitrate 10377-66-9 for CSR
EC Number: 233-828-8
CAS Number: 10377-66-9
Registration Number: 01-2119487993-17-0002
Date of Generation/Revision: 10/07/2017
Author: Cheminova A/S

Table of Contents

1. ES 1: Manufacture

1.1. Title section

ES name: Manufacture

Environment	
1: Manufacture	ERC 1
Worker	
2: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions	PROC 1
3: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition	PROC 3
4: Manual maintenance (cleaning and repair) of machinery	PROC 4
5: Bulk transfers	PROC 8b
6: Drum/batch transfers	PROC 9
7: Use of the substance within laboratory settings, including material transfers and equipment cleaning	PROC 15

1.2. Conditions of use affecting exposure

1.2.1. Control of environmental exposure: Manufacture (ERC 1)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 50.0 tonnes/day
Annual amount per site <= 999.0 tonnes/year
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.
Other conditions affecting environmental exposure
Assumed effluent discharge flow from site >= 0.0 m3/day

1.2.2. Control of worker exposure

Conditions of use applicable to all contributing scenarios

Product (Article) characteristics
Covers concentrations up to 25.0 % (The IOELV is based on the Manganese ion (Mn^{2+}) and therefore it is the concentration of Mn^{2+} in the $Mn(NO_3)_2$ solution that is crucial)
Technical and organisational conditions and measures
Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed.; Ensure control measures are regularly inspected and maintained.
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).
Conditions and measures related to personal protection, hygiene and health evaluation
Wear chemically resistant gloves (tested to EN374) in combination with specific activity training.; For further specification, refer to section 8 of the SDS.
Use suitable eye protection.
Other conditions affecting workers exposure
Indoor use
Assumes process temperature up to 40.0 °C

Specific conditions of use per contributing scenario

Contributing scenario	Specific conditions of use
Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC 1)	Covers use up to 8.0 h/day Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions
Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC 3)	Covers use up to 8.0 h/day Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition *Local exhaust ventilation. Inhalation - minimum efficiency of 90.0 %*
Manual maintenance (cleaning and repair) of machinery (PROC 4)	Covers use up to 8.0 h/day *Local exhaust ventilation. Inhalation - minimum efficiency of 90.0 %*
Bulk transfers (PROC 8b)	Covers use up to 4.0 h/day *Local exhaust ventilation. Inhalation - minimum efficiency of 95.0 %*
Drum/batch transfers (PROC 9)	Covers use up to 8.0 h/day *Local exhaust ventilation. Inhalation - minimum efficiency of 90.0 %*
Use of the substance within laboratory settings, including material transfers and equipment cleaning (PROC 15)	Covers use up to 8.0 h/day *Local exhaust ventilation. Inhalation - minimum efficiency of 90.0 %*

1.3. Exposure estimation and reference to its source

1.3.1. Environmental release and exposure: Manufacture (ERC 1)

Release route	Release rate	Release estimation method
Water	0 kg/day	Estimated release factor
Air	0 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Sewage Treatment Plant	0 mg/L (EUSES 2.1.2)	< 0.01

1.3.2. Worker exposure: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC 1)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (TRA Workers 3.0)	0.067
Dermal, systemic, long term	1.02E-3 mg/kg bw/day (TRA Workers 3.0)	< 0.01
Combined, systemic, long term		0.068

1.3.3. Worker exposure: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC 3)

Route of exposure and type of effects	Exposure estimate	RCR

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (TRA Workers 3.0)	0.067
Dermal, systemic, long term	0.021 mg/kg bw/day (TRA Workers 3.0)	0.018
Combined, systemic, long term		0.085

1.3.4. Worker exposure: Manual maintenance (cleaning and repair) of machinery (PROC 4)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (TRA Workers 3.0)	0.067
Dermal, systemic, long term	0.206 mg/kg bw/day (TRA Workers 3.0)	0.182
Combined, systemic, long term		0.249

1.3.5. Worker exposure: Bulk transfers (PROC 8b)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	4.03E-3 mg/m³ (TRA Workers 3.0)	0.02
Dermal, systemic, long term	0.411 mg/kg bw/day (TRA Workers 3.0)	0.364
Combined, systemic, long term		0.384

1.3.6. Worker exposure: Drum/batch transfers (PROC 9)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (TRA Workers 3.0)	0.067
Dermal, systemic, long term	0.206 mg/kg bw/day (TRA Workers 3.0)	0.182
Combined, systemic, long term		0.249

1.3.7. Worker exposure: Use of the substance within laboratory settings, including material transfers and equipment cleaning (PROC 15)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (TRA Workers 3.0)	0.067
Dermal, systemic, long term	0.01 mg/kg bw/day (TRA Workers 3.0)	< 0.01
Combined, systemic, long term		0.076

1.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

2. ES 2: Formulation or re-packing

2.1. Title section

ES name: Formulation or re-packing

Environment	
1: Formulation [mixing] of preparations and/or re-packaging	ERC 2
Worker	
2: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition	PROC 3
3: Bulk transfers	PROC 8b
4: Drum/batch transfers	PROC 9
5: *Transfer of solution outside (Without additional ventilation)*	PROC 9
6: Use of the substance within laboratory settings, including material transfers and equipment cleaning	PROC 15

2.2. Conditions of use affecting exposure

2.2.1. Control of environmental exposure: Formulation [mixing] of preparations and/or re-packaging (ERC 2)

Amount used, frequency and duration of use (or from service life)
Daily amount per site <= 10.0 tonnes/day
Annual amount per site <= 999.0 tonnes/year
Other conditions affecting environmental exposure
Assumed effluent discharge flow from site >= 0.0 m3/day

2.2.2. Control of worker exposure

Conditions of use applicable to all contributing scenarios

Product (Article) characteristics
Covers concentrations up to 25.0 % (The IOELV is based on the Manganese ion (Mn^{2+}) and therefore it is the concentration of Mn^{2+} in the $Mn(NO_3)_2$ solution that is crucial)
Technical and organisational conditions and measures
Supervision in place to check that the risk management measures in place are being used correctly and operation conditions followed.; Ensure control measures are regularly inspected and maintained.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear chemically resistant gloves (tested to EN374) in combination with specific activity training.; For further specification, refer to section 8 of the SDS.
Use suitable eye protection.
Other conditions affecting workers exposure
Assumes process temperature up to 40.0 °C

Specific conditions of use per contributing scenario

Contributing scenario	**Specific conditions of use**
Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled	Covers use up to 8.0 h/day Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition

exposure or processes with equivalent containment condition (PROC 3)	Provide a good standard of controlled ventilation (5 to 10 air changes per hour). *Local exhaust ventilation. Inhalation - minimum efficiency of 90.0 %* Indoor use
Bulk transfers (PROC 8b)	Covers use up to 8.0 h/day Provide a good standard of controlled ventilation (5 to 10 air changes per hour). *Local exhaust ventilation. Inhalation - minimum efficiency of 95.0 %* Indoor use
Drum/batch transfers (PROC 9)	Covers use up to 8.0 h/day Provide a good standard of controlled ventilation (5 to 10 air changes per hour). *Local exhaust ventilation. Inhalation - minimum efficiency of 90.0 %* Indoor use
***Transfer of solution outside (Without additional ventilation)* (PROC 9)**	Covers use up to 1.0 h/day Outdoor use
Use of the substance within laboratory settings, including material transfers and equipment cleaning (PROC 15)	Covers use up to 8.0 h/day Provide a good standard of controlled ventilation (5 to 10 air changes per hour). *Local exhaust ventilation. Inhalation - minimum efficiency of 90.0 %* Indoor use

2.3. Exposure estimation and reference to its source

2.3.1. Environmental release and exposure: Formulation [mixing] of preparations and/or re-packaging (ERC 2)

Release route	Release rate	Release estimation method
Water	0 kg/day	Estimated release factor
Air	0 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

Protection target	Exposure estimate	RCR
Sewage Treatment Plant	0 mg/L (EUSES 2.1.2)	< 0.01

2.3.2. Worker exposure: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC 3)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (TRA Workers 3.0)	0.067
Dermal, systemic, long term	0.021 mg/kg bw/day (TRA Workers 3.0)	0.018
Combined, systemic, long term		0.085

2.3.3. Worker exposure: Bulk transfers (PROC 8b)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	6.71E-3 mg/m³ (TRA Workers 3.0)	0.034
Dermal, systemic, long term	0.411 mg/kg bw/day (TRA Workers 3.0)	0.364
Combined, systemic, long term		0.398

2.3.4. Worker exposure: Drum/batch transfers (PROC 9)

Route of exposure and type of effects	Exposure estimate	RCR

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (TRA Workers 3.0)	0.067
Dermal, systemic, long term	0.206 mg/kg bw/day (TRA Workers 3.0)	0.182
Combined, systemic, long term		0.249

2.3.5. Worker exposure: *Transfer of solution outside (Without additional ventilation)* (PROC 9)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.063 mg/m³ (TRA Workers 3.0)	0.313
Dermal, systemic, long term	0.206 mg/kg bw/day (TRA Workers 3.0)	0.182
Combined, systemic, long term		0.495

2.3.6. Worker exposure: Use of the substance within laboratory settings, including material transfers and equipment cleaning (PROC 15)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	0.013 mg/m³ (TRA Workers 3.0)	0.067
Dermal, systemic, long term	0.01 mg/kg bw/day (TRA Workers 3.0)	< 0.01
Combined, systemic, long term		0.076

2.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES

3. ES 3: Widespread use by professional workers; Fertilizers; Agriculture, forestry, fishery

3.1. Title section

ES name: Fertilizers (soil amendments)
Product category: Fertilizers (PC 12)
Sector of use: Agriculture, forestry, fishery (SU 1)

Environment	
1: Widespread use of reactive processing aid (no inclusion into or onto article, outdoor)	ERC 8e
Worker	
2: Widespread use by professional workers	PROC 11

3.2. Conditions of use affecting exposure

3.2.1. Control of environmental exposure: Widespread use of reactive processing aid (no inclusion into or onto article, outdoor) (ERC 8e)

Conditions and measures related to biological sewage treatment plant
Municipal sewage treatment plant is assumed.
Conditions and measures related to external treatment of waste (including article waste)
Dispose of waste product or used containers according to local regulations.

3.2.2. Control of worker exposure

Conditions of use applicable to all contributing scenarios

Product (Article) characteristics
Covers concentrations up to 25.0 % (The IOELV is based on the Manganese ion (Mn^{2+}) and therefore it is the concentration of Mn^{2+} in the $Mn(NO_3)_2$ solution that is crucial)
Amount used (or contained in articles), frequency and duration of use/exposure
Covers use up to 8.0 h/day
Other conditions affecting workers exposure
Outdoor use
Assumes process temperature up to 30.0 °C

3.3. Exposure estimation and reference to its source

3.3.1. Environmental release and exposure: Widespread use of reactive processing aid (no inclusion into or onto article, outdoor) (ERC 8e)

Release route	Release rate	Release estimation method
Water	0 kg/day	Estimated release factor
Air	0 kg/day	Estimated release factor
Soil	0 kg/day	Estimated release factor

3.3.2. Worker exposure: Widespread use by professional workers (PROC 11)

Route of exposure and type of effects	Exposure estimate	RCR
Inhalation, systemic, long term	1.1E-3 mg/m³ (German model)	< 0.01

Route of exposure and type of effects	Exposure estimate	RCR
Dermal, systemic, long term	0.019 mg/kg bw/day (UK Pesticide Operator Exposure Model (POEM))	0.017
Combined, systemic, long term		0.022

3.4. Guidance to DU to evaluate whether he works inside the boundaries set by the ES