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

1.1 Product identifier

Trade name	:	ETBE
REACH Registration Number	:	01-2119452785-29-XXXX
Substance name	:	tert-Butyl ethyl ether
EC-No.	:	211-309-7

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

Use of the Substance/Mixture	:	Raw material in chemical industry, Manufacture, Formulation, Distribution, Fuel use - Industrial, Fuel use - Professional, Fuel use - Consumer

1.3 Details of the supplier of the safety data sheet

Manufacturer	:	Borealis AB S-444 86 Stenungsund, Sweden Telephone: +46 303 86000
Supplier	:	Borealis AG Trabrennstrasse 6-8, 1020 Vienna, Austria Telephone: +43 1 22400 0
E-mail address	:	sds@borealisgroup.com

1.4 Emergency telephone number

+44 (0) 1235 239 670 (NCEC Carechem 24)

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification (REGULATION (EC) No 1272/2008)

Flammable liquids, Category 2	H225: Highly flammable liquid and vapour.
Specific target organ toxicity - single exposure, Category 3, Central nervous system	H336: May cause drowsiness or dizziness.

2.2 Label elements

Labelling (REGULATION (EC) No 1272/2008)

Hazard pictograms :

Signal word : Danger

Hazard statements : H225 Highly flammable liquid and vapour.
H336 May cause drowsiness or dizziness.

Precautionary statements : **Prevention:**

P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P243 Take action to prevent static discharges.
P261 Avoid breathing mist or vapours.
P271 Use only outdoors or in a well-ventilated area.

Response:

P304 + P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

Storage:

P403 + P233 Store in a well-ventilated place. Keep container tightly closed.

2.3 Other hazards

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

Ecological information: The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

Toxicological information: The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis.

SECTION 3: Composition/information on ingredients

3.1 Substances

Substance name : tert-Butyl ethyl ether

EC-No. : 211-309-7

Components

Chemical name	CAS-No. EC-No.	Concentration (% w/w)	M-Factor, SCL, ATE
2-Ethoxy-2-methylpropane	637-92-3 211-309-7	> 95	
ethanol	64-17-5 200-578-6	0 - 5	
tert-butyl methyl ether	1634-04-4 216-653-1	0 - 5	

SECTION 4: First aid measures

4.1 Description of first aid measures

General advice : In the case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
Move out of dangerous area.
Remove contaminated clothing and shoes.
Consult a physician.
Show this safety data sheet to the doctor in attendance.
Remove victim from exposure and then have him lie down in the recovery position.
Do not leave the victim unattended.
Keep patient warm and at rest.

If inhaled : Seek medical advice immediately.
If breathing is difficult, give oxygen.
If unconscious, place in recovery position and seek medical advice.

In case of skin contact : Wash off immediately with soap and plenty of water.
Remove contaminated clothing and shoes.
Get medical attention if irritation develops and persists.

In case of eye contact : Rinse thoroughly with plenty of water, also under the eyelids.
If easy to do, remove contact lens, if worn.

Seek medical advice immediately.

If swallowed : Rinse mouth with water.
Do NOT induce vomiting.
Seek medical advice immediately.

4.2 Most important symptoms and effects, both acute and delayed

Symptoms : Inhalation may cause central nervous system effects.
Inhalation may provoke the following symptoms:
Breathing difficulties
Fever
Shortness of breath
Suffocation
Cough
Headache

Ingestion may provoke the following symptoms:
Dizziness
Fatigue
Drowsiness
Weakness
Lack of coordination

Symptoms may be delayed.

Risks : May cause drowsiness or dizziness.

4.3 Indication of any immediate medical attention and special treatment needed

Treatment : In case of ingestion, the stomach should be emptied by gastric lavage under qualified medical supervision.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media : Dry powder
Carbon dioxide (CO2)
Alcohol-resistant foam
Water spray

Unsuitable extinguishing media : Do not use a solid water stream as it may scatter and spread fire.

5.2 Special hazards arising from the substance or mixture

Specific hazards during firefighting : Vapours may form explosive mixtures with air.
Flash back possible over considerable distance.
Risk of explosion.

5.3 Advice for firefighters

Special protective equipment for firefighters	:	Wear self-contained breathing apparatus and protective suit.
Further information	:	Keep people away from and upwind of spill/leak. Cool containers/tanks with water spray.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment.
Avoid breathing vapours, mist or gas.
Ensure adequate ventilation, especially in confined areas.
Keep people away from and upwind of spill/leak.
Eliminate all ignition sources if safe to do so.
See chapter 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so.
Prevent product from entering environment and drains.
If major spillage occurs, contact the proper local authorities.
Do not allow material to contaminate ground water system.
Evaporates.

6.3 Methods and material for containment and cleaning up

Contain spillage, soak up with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and transfer to a container for disposal according to local / national regulations (see section 13).
Use antispark tools (e.g. aluminium, plastic) to pick up the material.
Wipe up with absorbent material (e.g. cloth, fleece).

6.4 Reference to other sections

For personal protection see section 8., For disposal considerations see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling	:	Refill and handle product only in closed system. Do not use in areas without adequate ventilation. Ensure that eyewash stations and safety showers are close to the workstation location. Avoid exposure - obtain special instructions before use.

Advice on protection against fire and explosion	:	Take precautionary measures against static discharges. To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded. Electrical equipment should be protected to the appropriate standard. Ensure adequate ventilation. Keep away from sources of ignition - No smoking.

7.2 Conditions for safe storage, including any incompatibilities

Advice on common storage	:	Keep away from combustible material. Keep away from incompatible materials. See chapter 10.
Packaging material	:	Suitable material: Carbon steel

7.3 Specific end use(s)

Specific use(s)	:	Not applicable

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Contains no substances with occupational exposure limit values., For national exposure limit (OEL) values, check country specific safety data sheets.

Derived No Effect Level (DNEL) according to Regulation (EC) No. 1907/2006:

Substance name	End Use	Exposure routes	Potential health effects	Value
ETBE	Workers	Inhalation	Acute effects, Systemic	2800 mg/m3
	Workers	Skin contact	Long-term, Systemic	6767 mg/kg
	Workers	Inhalation	Long-term, Systemic	352 mg/m3
	Workers	Inhalation	Long-term, Local effects	105 mg/m3
	Consumers	Inhalation	Acute effects, Systemic	1680 mg/m3
	Consumers	Skin contact	Long-term, Systemic	4060 mg/kg
	Consumers	Inhalation	Long-term, Systemic	105 mg/m3
	Consumers	Ingestion	Long-term, Systemic	6 mg/kg
	Consumers	Inhalation	Long-term, Local effects	63 mg/m3

Predicted No Effect Concentration (PNEC) according to Regulation (EC) No. 1907/2006:

Substance name	Environmental Compartment	Value
ETBE	Fresh water	0,51 mg/l
	Marine water	0,017 mg/l

		Water	11 mg/l
Remarks:	Intermittent use/release		
		Fresh water sediment	0,62 mg/kg wet weight
		Marine sediment	0,017 mg/kg wet weight
		Soil	0,24 mg/kg wet weight
		Sewage treatment plant	12,5 mg/l

8.2 Exposure controls

Engineering measures

Application in a closed system
Provide adequate ventilation.
Use personal protective equipment.

Personal protective equipment

Eye protection : Wear goggles and if needed face-shield.
Equipment should conform to EN 166

Hand protection
Material : Nitrile rubber
Break through time : > 8 h

Material : Viton®
Break through time : > 8 h

Remarks : Wear suitable gloves:
The selected protective gloves have to satisfy the specifications of Regulation (EU) 2016/425 and the standard EN 374 derived from it. Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. Also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion, and the contact time. Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough. Gloves must be rinsed thoroughly after use. or

Skin and body protection : Wear suitable protective clothing and rubber boots.
During handling operations:
Flame retardant protective clothing

Respiratory protection : In case of insufficient ventilation: Respirator with A2 or ABEK filter or self-contained breathing apparatus.

Environmental exposure controls

General advice : Prevent further leakage or spillage if safe to do so. Prevent

product from entering environment and drains. If major spillage occurs, contact the proper local authorities. Do not allow material to contaminate ground water system. Evaporates.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Physical state	:	liquid
Colour	:	pale yellowish
Odour	:	ether-like
Odour Threshold	:	13 ppb
Melting point	:	-94 °C
Boiling point	:	73,1 °C
Flammability	:	Highly flammable.
Upper explosion limit / Upper flammability limit	:	6 %(V)
Lower explosion limit / Lower flammability limit	:	1 %(V)
Flash point	:	-19 °C
Decomposition temperature	:	Heating or fire can release toxic and irritating gases.
pH	:	ca. 6,4 Method: ASTM D6423
Viscosity		
Viscosity, dynamic	:	No data available
Viscosity, kinematic	:	0,53 mm²/s (20 °C)
		0,47 mm²/s (40 °C)
Solubility(ies)		
Water solubility	:	16,4 g/l (20 °C)
Partition coefficient: n-	:	log Pow: 1,48 (20 °C)

octanol/water		
Vapour pressure	:	170 hPa (25 °C)
Relative density	:	0,75 (15 °C)
Density	:	750 g/cm³
Relative vapour density	:	ca. 3,5 (15 °C) (Air = 1.0)

9.2 Other information

Explosives	:	Not explosive
Oxidizing properties	:	The substance or mixture is not classified as oxidizing.
Self-ignition	:	392 °C 1.003,4 - 1.009,2 hPa
Evaporation rate	:	No data available
Molecular weight	:	102,17 g/mol

SECTION 10: Stability and reactivity

10.1 Reactivity

No dangerous reaction known under conditions of normal use.

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

Hazardous reactions	:	Vapours may form explosive mixture with air. Reacts with air to form peroxides. Flammable gases may be released if in contact with the following: Strong acids

10.4 Conditions to avoid

Conditions to avoid	:	Heat, flames and sparks.

10.5 Incompatible materials

Materials to avoid	:	Strong oxidizing agents Strong acids

Strong bases
Oxygen
Air

10.6 Hazardous decomposition products

Carbon monoxide (CO)
Toxic fumes

SECTION 11: Toxicological information

11.1 Information on hazard classes as defined in Regulation (EC) No 1272/2008

Acute toxicity

Based on available data, the classification criteria are not met.

Product:

Acute oral toxicity	:	LD50: > 2.003 mg/kg Method: OECD Test Guideline 401
Acute inhalation toxicity	:	LC50 (Rat): > 5,88 mg/l Exposure time: 4 h Test atmosphere: vapour Method: OECD Test Guideline 403
Acute dermal toxicity	:	LD50 (Rabbit): > 2.000 mg/kg Method: OECD Test Guideline 402
Acute toxicity (other routes of administration)	:	Remarks: No data available

Skin corrosion/irritation

Based on available data, the classification criteria are not met.

Product:

Species	:	Rabbit
Method	:	OECD Test Guideline 404
Result	:	No skin irritation
GLP	:	yes

Serious eye damage/eye irritation

Based on available data, the classification criteria are not met.

Product:

Species	:	Rabbit
Method	:	OECD Test Guideline 405
Result	:	No eye irritation

GLP : yes

Respiratory or skin sensitisation

Skin sensitisation

Based on available data, the classification criteria are not met.

Respiratory sensitisation

Based on available data, the classification criteria are not met.

Product:

Exposure routes	:	Skin contact
Species	:	Guinea pig
Method	:	OECD Test Guideline 406
Result	:	Did not cause sensitisation on laboratory animals.
GLP	:	yes

Exposure routes	:	Inhalation
Remarks	:	No data available

Germ cell mutagenicity

Based on available data, the classification criteria are not met.

Product:

Genotoxicity in vitro	:	Test Type: Ames test Method: Mutagenicity (Escherichia coli - reverse mutation assay) Result: negative GLP: yes
	:	Test Type: Chromosome aberration test in vitro Method: OECD Test Guideline 473 Result: negative GLP: yes
Genotoxicity in vivo	:	Test Type: in vivo assay Species: Mouse Method: OECD Test Guideline 474 Result: negative

Carcinogenicity

Based on available data, the classification criteria are not met.

Product:

Species	:	Rat, male and female

Application Route	:	Oral
NOAEC	:	550 mg/kg bw/d
Species	:	Rat, male
Application Route	:	Inhalation
NOAEC	:	1.500 ppm

Reproductive toxicity

Based on available data, the classification criteria are not met.

Product:

Effects on fertility	:	Species: Rat Application Route: Ingestion NOAEL: 1000 mg/kg bw/day, Method: OECD Test Guideline 416
Effects on foetal development	:	Species: Rat Application Route: Oral 1000 mg/kg bw/d Number of exposures: 7d/w Test period: 15 d Method: OECD Test Guideline 414 Species: Rat Application Route: Oral 1000 mg/kg bw/d 300 mg/kg bw/d Method: OECD Test Guideline 414 Species: Rat Application Route: Oral 500 mg/kg bw/d Method: OECD Test Guideline 414

STOT - single exposure

May cause drowsiness or dizziness.

STOT - repeated exposure

Based on available data, the classification criteria are not met.

Repeated dose toxicity

Product:

Species	:	Rat, male
NOAEL	:	121 mg/kg
Application Route	:	Oral
Exposure time	:	730 d
Method	:	OECD Test Guideline 453

Species	:	Rat, male and female
NOAEC	:	2,1 mg/l
Application Route	:	inhalation (vapour)
Exposure time	:	730 d
Method	:	OECD Test Guideline 453

Aspiration toxicity

Based on available data, the classification criteria are not met.

11.2 Information on other hazards

Endocrine disrupting properties

Product:

Assessment	:	The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

Experience with human exposure

Product:

General Information	:	Exposure to the vapour may result in lowering of consciousness. Inhalation of high vapour concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis.

Neurological effects

Product:

Inhalation may cause central nervous system effects.

Further information

Product:

Remarks	:	Prolonged skin contact may defat the skin and produce dermatitis. Components of the product may be absorbed into the body by inhalation and ingestion.

SECTION 12: Ecological information

12.1 Toxicity

Product:

Toxicity to fish	:	LC50 (guppy (Poecilia reticulata)): > 974 mg/l Exposure time: 96 h Test Type: semi-static test Method: OECD Test Guideline 203 GLP: no Remarks: Fresh water LC50 (tidewater silverside (Menidia beryllina)): > 57,4 mg/l Exposure time: 96 h Test Type: semi-static test Method: OECD Test Guideline 203 GLP: no Remarks: Read-across (Analogy) Marine water
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia magna (Water flea)): 110 mg/l Exposure time: 48 h Test Type: static test Method: OECD Test Guideline 202 GLP: yes Remarks: Fresh water EC50 (Americamysis bahia (shrimp)): 37 mg/l Exposure time: 96 h Test Type: semi-static test Method: EPA OTS 797.1930 Remarks: Marine water
Toxicity to algae/aquatic plants	:	EC50 (Pseudokirchneriella subcapitata (green algae)): 1.100 mg/l Exposure time: 72 h Test Type: static test Method: OECD Test Guideline 201 GLP: yes Remarks: Fresh water NOEC (Pseudokirchneriella subcapitata (green algae)): 7,5 mg/l Exposure time: 72 h Test Type: static test Method: OECD Test Guideline 201 GLP: yes Remarks: Fresh water

Toxicity to fish (Chronic toxicity)	:	NOEC: 64 mg/l Exposure time: 5 d Species: Danio rerio (zebra fish) Method: OECD Test Guideline 212
Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity)	:	NOEC: 5,1 mg/l Exposure time: 21 d Species: Daphnia magna (Water flea) Test Type: flow-through test Method: EPA OPPTS 850.1300 Remarks: Read-across (Analogy) Fresh water NOEC: 1,7 mg/l Exposure time: 28 d Species: Americamysis bahia (shrimp) Test Type: flow-through test Method: EPA OPPTS 850.1350 Remarks: Read-across (Analogy) Marine water
Toxicity to microorganisms	:	NOEC (Pseudomonas putida): 12,5 mg/l Exposure time: 16 h Test Type: Respiration inhibition Method: ISO 10712 GLP: Remarks: Read-across (Analogy) Fresh water

12.2 Persistence and degradability

Product:

Biodegradability	:	activated sludge, adapted Biodegradation: 6,6 % Exposure time: 7 d Method: OECD Test Guideline 301D Test Type: anaerobic Water Biodegradation: 0 % Exposure time: 244 d Soil Kinetic: 151 d: 66 % Remarks: Not readily biodegradable.

12.3 Bioaccumulative potential

Product:

Bioaccumulation	:	Remarks: No experimental BCF value is available. Bioaccumulation not expected: Partition coefficient (n-octanol/water) log Pow < 3.

12.4 Mobility in soil

Product:

Mobility	:	Medium: Air Remarks: 96,2% Medium: Water Remarks: 3,7% Medium: Soil Remarks: 0,1%, Partition coefficient (n-octanol/water) log Kow < 3.
Distribution among environmental compartments	:	Remarks: The product evaporates readily to air., Not expected to adsorb on soil.

12.5 Results of PBT and vPvB assessment

Product:

Assessment	:	This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher..

12.6 Endocrine disrupting properties

Product:

Assessment	:	The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605 at levels of 0.1% or higher.

12.7 Other adverse effects

Product:

Environmental fate and pathways	:	Photodegradable.

Additional ecological information	:	No known effect.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product	:	Do not contaminate ponds, waterways or ditches with chemical or used container. Do not dispose of waste into sewer. Dispose of as hazardous waste in compliance with local and national regulations.
Contaminated packaging	:	Dispose of as hazardous waste in compliance with local and national regulations.

SECTION 14: Transport information

14.1 UN number or ID number

ADR	:	UN 1179
IMDG	:	UN 1179

14.2 UN proper shipping name

ADR	:	ETHYL BUTYL ETHER
IMDG	:	ETHYL BUTYL ETHER

14.3 Transport hazard class(es)

ADR	:	3
IMDG	:	3

14.4 Packing group

ADR

Packing group	:	II
Classification Code	:	F1
Hazard Identification Number	:	33
Labels	:	3
Tunnel restriction code	:	(D/E)

IMDG

Packing group	:	II
Labels	:	3

EmS Code : F-E, S-D

14.5 Environmental hazards

ADR
Environmentally hazardous : no

IMDG
Marine pollutant : no

14.6 Special precautions for user

Remarks :
SDS: No specific instructions needed.

The transport classification(s) provided herein are for informational purposes only, and solely based upon the properties of the unpackaged material as it is described within this Safety Data Sheet. Transportation classifications may vary by mode of transportation, package sizes, and variations in regional or country regulations.

14.7 Maritime transport in bulk according to IMO instruments

Ship type : 3
Pollution category : Y

SECTION 15: Regulatory information

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

REACH - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles (Annex XVII) : Conditions of restriction for the following entries should be considered:
Number on list 40, 3

Seveso III: Directive 2012/18/EU of the European Parliament and of the Council on the control of major-accident hazards involving dangerous substances.
FLAMMABLE LIQUIDS

Other regulations:
No data available

15.2 Chemical safety assessment

A Chemical Safety Assessment has been carried out for this substance.

SECTION 16: Other information

Full text of other abbreviations

Further information

Other information	:	Changes since the last version are highlighted in the margin. This version replaces all previous versions.
Issuer	:	Borealis, Group Product Stewardship / Mikaela Eriksson.
Sources of key data used to compile the Safety Data Sheet	:	Chemical Safety Report, 2-ethoxy-2-methylpropane (ETBE), 2014 Information taken from reference works and the literature.

Disclaimer

To the best of our knowledge, the information contained herein is accurate and reliable as of the date of publication; however we do not assume any liability whatsoever for the accuracy and completeness of such information.

Borealis makes no warranties which extend beyond the description contained herein. Nothing herein shall constitute any warranty of merchantability or fitness for a particular purpose.

It is the customer's responsibility to inspect and test our products in order to satisfy itself as to the suitability of the products for the customer's particular purpose. The customer is responsible for the appropriate, safe and legal use, processing and handling of our products.

No liability can be accepted in respect of the use of Borealis' products in conjunction with other materials. The information contained herein relates exclusively to our products when not used in conjunction with any third party materials.

Annex: Exposure Scenarios

Table of Contents

ES1: Manufacture of substance

1.1. Title section

Structured Short Title	:	Manufacture, Manufacture of substance

Environment		
CS1	**Manufacture of substance**	ERC1
Worker		
CS2	**General measures**	PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC15
CS3	**General exposures (closed systems)**	PROC1
CS4	**General exposures (closed systems), With sample collection**	PROC2
CS5	**General exposures (closed systems), Use in contained batch processes, With sample collection**	PROC3
CS6	**General exposures (open systems), Batch process, With sample collection, Filling of equipment from drums or containers**	PROC4
CS7	**Process sampling, Dedicated facility**	PROC8b
CS8	**Laboratory activities**	PROC15
CS9	**Bulk transfers, Non-dedicated facility**	PROC8a
CS10	**Bulk transfers, Dedicated facility**	PROC8b
CS11	**Equipment cleaning and maintenance, Non-dedicated facility**	PROC8a
CS12	**Storage, General exposures (closed systems)**	PROC1
CS13	**Storage, General exposures (closed systems), With sample collection**	PROC2

1.2. Conditions of use affecting exposure

1.2.1. Control of environmental exposure: Manufacture of the substance (ERC1)

Product (article) characteristics		
Covers percentage substance in the product up to 100 %.		
Vapour pressure	:	Liquid, vapour pressure > 10 kPa at Standard Temperature and Pressure
Amount used, frequency and duration of use (or from service life)		
Daily amount per site	:	905000 kg
Annual amount per site	:	271600 ton(s)/year
Release type	:	Continuous release
Emission days	:	300
Technical and organisational conditions and measures		
No air emission controls required; required removal efficiency is 0%.		
Soil emission controls are not applicable as there is no direct release to soil.		
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%): Water - minimum efficiency of > 99 %		
Prevent discharge of undissolved substance to or recover from onsite wastewater.		
Conditions and measures related to sewage treatment plant		
STP type	:	Onsite Sewage Treatment Plant
STP effluent	:	2.000 m³/d
STP type	:	Municipal Sewage Treatment Plant
STP effluent	:	2.000 m³/d
Estimated substance removal from wastewater via domestic sewage treatment: Water - minimum efficiency of 99 %		
Conditions and measures related to treatment of waste (including article waste)		
Waste treatment	:	External treatment and disposal of waste should comply with applicable local and/or national regulations. External recovery and recycling of waste should comply with applicable local and/or national regulations.
Other conditions affecting environmental exposure		
Local freshwater dilution factor	:	10

Local marine water dilution factor	:	100
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply		
None.		

1.2.2. Control of worker exposure: General measures
Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1) / Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2) / Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC3) / Chemical production where opportunity for exposure arises (PROC4) / Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a) / Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b) / Use as laboratory reagent (PROC15)

Product (article) characteristics		
Covers percentage substance in the product up to 100 %.		
Vapour pressure	:	Liquid, vapour pressure > 10 kPa at Standard Temperature and Pressure
Amount used, frequency and duration of use (or from service life)		
Duration	:	Covers daily exposures up to 8 hours
Technical and organisational conditions and measures		
Common practices vary across sites thus conservative process release estimates used.		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Outdoor use
Temperature	:	Assumes use at not more than 20°C above ambient temperature.
Assumes a good basic standard of occupational hygiene is implemented		

1.2.3. Control of worker exposure: General exposures (closed systems)
Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Technical and organisational conditions and measures

No other specific measures identified.

1.2.4. Control of worker exposure: General exposures (closed systems), With sample collection
Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Duration of the acitivity < 4 h
Technical and organisational conditions and measures		
Ensure operation is undertaken outdoors.		
Conditions and measures related to personal protection, hygiene and health evaluation		
Wear a respirator conforming to EN140 with Type A filter or better.		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Outdoor use

1.2.5. Control of worker exposure: General exposures (closed systems), Use in contained batch processes, With sample collection
Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC3)

Technical and organisational conditions and measures
Provide extract ventilation to points where emissions occur.

1.2.6. Control of worker exposure: General exposures (open systems), Batch process, With sample collection, Filling of equipment from drums or containers
Chemical production where opportunity for exposure arises (PROC4)

Technical and organisational conditions and measures
Provide extract ventilation to points where emissions occur.

1.2.7. Control of worker exposure: Process sampling, Dedicated facility
Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Technical and organisational conditions and measures

Provide extract ventilation to points where emissions occur.

1.2.8. Control of worker exposure: Laboratory activities
Use as laboratory reagent (PROC15)

Technical and organisational conditions and measures
Handle in a fume cupboard or under extract ventilation.

1.2.9. Control of worker exposure: Bulk transfers, Non-dedicated facility
Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Duration of the acitivity < 4 h
Technical and organisational conditions and measures		
Transfer via enclosed lines. Clear transfer lines prior to de-coupling.		
Conditions and measures related to personal protection, hygiene and health evaluation		
Wear a respirator conforming to EN140 with Type A filter or better.		

1.2.10. Control of worker exposure: Bulk transfers, Dedicated facility
Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Duration of the acitivity 4 h
Technical and organisational conditions and measures		
Transfer via enclosed lines. Clear transfer lines prior to de-coupling.		
Conditions and measures related to personal protection, hygiene and health evaluation		
Wear a respirator conforming to EN140 with Type A filter or better.		

1.2.11. Control of worker exposure: Equipment cleaning and maintenance, Non-dedicated facility
Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Duration of the acitivity < 1 h
Technical and organisational conditions and measures		
Drain down and flush system prior to equipment break-in or maintenance.		
Conditions and measures related to personal protection, hygiene and health evaluation		
Wear a respirator conforming to EN140 with Type A filter or better.		

1.2.12. Control of worker exposure: Storage, General exposures (closed systems)
Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Technical and organisational conditions and measures
No other specific measures identified.

1.2.13. Control of worker exposure: Storage, General exposures (closed systems), With sample collection
Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Duration of the acitivity < 4 h
Technical and organisational conditions and measures		
Provide extract ventilation to points where emissions occur.		
Conditions and measures related to personal protection, hygiene and health evaluation		
Wear a respirator conforming to EN140 with Type A filter or better.		

1.3. Exposure estimation and reference to its source

1.3.1. Environmental release and exposure: Manufacture of the substance (ERC1)

Release route	**Release rate**	**Release estimation method**

Air	0,005	ESVOC SPERC 1.1.v1
Water	0,01	ESVOC SPERC 1.1.v1
Soil	0,000	ESVOC SPERC 1.1.v1

Compartment	Exposure level	RCR
Sewage treatment plant	0,0115 mg/L (EUSES)	0,001
Surface water	0,0016 mg/L (EUSES)	0,003
Freshwater sediment	0,00192 mg/kg wet weight (EUSES)	0,003
Marine water	0,000184 mg/L (EUSES)	0,011
Marine sediment	0,00022 mg/kg wet weight (EUSES)	0,011
Agricultural soil	0,200 mg/kg wet weight (EUSES)	0,833
Grassland	0,207 mg/kg wet weight (EUSES)	0,863

Additional information on exposure estimation
Risk from environmental exposure is driven by soil.

1.3.3. Worker exposure: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	0,042 mg/m³	< 0,01	
inhalative		short-term	0,17 mg/m³	< 0,01	
dermal			0,03 mg/kg/d	< 0,001	

1.3.4. Worker exposure: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	45 mg/m³	< 0,43	
inhalative		short-term	290 mg/m³	0,11	
dermal			0,82 mg/kg/d	< 0,001	

1.3.5. Worker exposure: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC3)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	21 mg/m³	0,2	
inhalative		short-term	85 mg/m³	0,03	
dermal			0,069 mg/kg/d	< 0,001	

1.3.6. Worker exposure: Chemical production where opportunity for exposure arises (PROC4)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	43 mg/m³	0,4	
inhalative		short-term	170 mg/m³	0,06	
dermal			0,69 mg/kg/d	< 0,001	

1.3.7. Worker exposure: Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	32 mg/m³	0,3	
inhalative		short-term	120 mg/m³	0,05	
dermal			0,69 mg/kg/d	< 0,001	

1.3.8. Worker exposure: Use as laboratory reagent (PROC15)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	21 mg/m³	0,2	
inhalative		short-term	85 mg/m³	0,03	
dermal			0,03 mg/kg/d	< 0,001	

1.3.9. Worker exposure: Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	100 mg/m³	0,95	

inhalative		short-term	180 mg/m³	0,06	
dermal			8,2 mg/kg/d	0,001	

1.3.10. Worker exposure: Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	100 mg/m³	0,95	
inhalative		short-term	180 mg/m³	0,06	
dermal			8,2 mg/kg/d	0,001	

1.3.11. Worker exposure: Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	21 mg/m³	0,2	
inhalative		short-term	420 mg/m³	0,15	
dermal			2,7 mg/kg/d	< 0,001	

1.3.12. Worker exposure: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	0,042 mg/m³	< 0,01	
inhalative		short-term	0,17 mg/m³	< 0,01	
dermal			0,03 mg/kg/d	< 0,001	

1.3.13. Worker exposure: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	6,3 mg/m³	0,06	
inhalative		short-term	43 mg/m³	0,02	
dermal			0,82 mg/kg/d	< 0,001	

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

Environment:
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required.
Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).
Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination.
Health
No data available

ES2: Formulation & (re)packing of substances and mixtures

2.1. Title section

Structured Short Title	:	Formulation or re-packing, Formulation & (re)packing of substances and mixtures

Environment		
CS1	**Environment**	ERC2
Worker		
CS2	**Formulation & (re)packing of substances and mixtures**	PROC1, PROC2, PROC3, PROC4, PROC5, PROC8a, PROC8b, PROC9, PROC15
CS3	**General exposures (closed systems)**	PROC1
CS4	**General exposures (closed systems), With sample collection**	PROC2
CS5	**General exposures (closed systems), Use in contained batch processes, With sample collection**	PROC3
CS6	**General exposures (open systems), Batch process, With sample collection, Filling of equipment from drums or containers**	PROC4
CS7	**General exposures (open systems), Batch processes at elevated temperatures, With sample collection**	PROC3
CS8	**Process sampling, Dedicated facility**	PROC3
CS9	**Laboratory activities**	PROC15
CS10	**Bulk transfers, Dedicated facility**	PROC8b
CS11	**Mixing operations (open systems), Batch process**	PROC5
CS12	**Manual, Transfer from/pouring from containers, Non-dedicated facility**	PROC8a
CS13	**Drum/batch transfers, Dedicated facility**	PROC8b
CS14	**Drum and small package filling, Dedicated facility**	PROC9
CS15	**Equipment cleaning and maintenance, Non-dedicated facility**	PROC8a

CS16	**Storage, General exposures (closed systems)**	PROC1
CS17	**Storage, General exposures (closed systems), With sample collection**	PROC2

2.2. Conditions of use affecting exposure

2.2.1. Control of environmental exposure: Formulation into mixture (ERC2)

Product (article) characteristics		
Covers percentage substance in the product up to 100 %.		
Vapour pressure	:	Liquid, vapour pressure > 10 kPa at Standard Temperature and Pressure
Amount used, frequency and duration of use (or from service life)		
Daily amount per site	:	150000 kg
Annual amount per site	:	45050 ton(s)/year
Release type	:	Continuous release
Emission days	:	300
Technical and organisational conditions and measures		
No air emission controls required; required removal efficiency is 0%.		
Soil emission controls are not applicable as there is no direct release to soil.		
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%): Water - minimum efficiency of > 99 %		
Prevent discharge of undissolved substance to or recover from onsite wastewater.		
Conditions and measures related to sewage treatment plant		
STP type	:	Onsite sewage treatment plant
STP effluent	:	2.000 m³/d
STP type	:	Municipal sewage treatment plant
STP effluent	:	2.000 m³/d
Estimated substance removal from wastewater via domestic sewage treatment: Water - minimum efficiency of 99 %		

Conditions and measures related to treatment of waste (including article waste)		
Waste treatment	:	External treatment and disposal of waste should comply with applicable local and/or national regulations. External recovery and recycling of waste should comply with applicable local and/or national regulations.
Other conditions affecting environmental exposure		
Local freshwater dilution factor	:	10
Local marine water dilution factor	:	100
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply		
None.		

2.2.2. Control of worker exposure: Formulation & (re)packing of substances and mixtures Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1) / Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2) / Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC3) / Chemical production where opportunity for exposure arises (PROC4) / Mixing or blending in batch processes (PROC5) / Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a) / Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b) / Transfer of substance or mixture into small containers (dedicated filling line, including weighing) (PROC9) / Use as laboratory reagent (PROC15)

Product (article) characteristics		
Covers percentage substance in the product up to 100 %.		
Vapour pressure	:	Liquid, vapour pressure > 10 kPa at Standard Temperature and Pressure
Amount used, frequency and duration of use (or from service life)		
Duration	:	Covers daily exposures up to 8 hours
Technical and organisational conditions and measures		
Common practices vary across sites thus conservative process release estimates used.		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Outdoor use

Temperature	:	Assumes use at not more than 20°C above ambient temperature.
Assumes a good basic standard of occupational hygiene is implemented		

2.2.3. Control of worker exposure: General exposures (closed systems)
Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Technical and organisational conditions and measures
No other specific measures identified.

2.2.4. Control of worker exposure: General exposures (closed systems), With sample collection
Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Duration of the acitivity < 4 h
Technical and organisational conditions and measures		
Ensure operation is undertaken outdoors.		
Conditions and measures related to personal protection, hygiene and health evaluation		
Wear a respirator conforming to EN140 with Type A filter or better.		

2.2.5. Control of worker exposure: General exposures (closed systems), Use in contained batch processes, With sample collection
Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC3)

Technical and organisational conditions and measures
Provide extract ventilation to points where emissions occur.

2.2.6. Control of worker exposure: General exposures (open systems), Batch process, With sample collection, Filling of equipment from drums or containers
Chemical production where opportunity for exposure arises (PROC4)

Technical and organisational conditions and measures

Provide extract ventilation to points where emissions occur.

2.2.7. Control of worker exposure: General exposures (open systems), Batch processes at elevated temperatures, With sample collection
Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC3)

Technical and organisational conditions and measures
Provide extract ventilation to points where emissions occur. Formulate in enclosed or ventilated mixing vessels.

2.2.8. Control of worker exposure: Process sampling, Dedicated facility
Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC3)

Technical and organisational conditions and measures
Provide extract ventilation to points where emissions occur.

2.2.9. Control of worker exposure: Laboratory activities
Use as laboratory reagent (PROC15)

Technical and organisational conditions and measures
Provide a good standard of controlled ventilation (10 to 15 air changes per hour).

2.2.10. Control of worker exposure: Bulk transfers, Dedicated facility
Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Technical and organisational conditions and measures
Provide extract ventilation to material transfer points and other openings.

2.2.11. Control of worker exposure: Mixing operations (open systems), Batch process
Mixing or blending in batch processes (PROC5)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Duration of the acitivity < 4 h

Technical and organisational conditions and measures
Provide extract ventilation to points where emissions occur.
Conditions and measures related to personal protection, hygiene and health evaluation
Wear a respirator conforming to EN140 with Type A filter or better.

2.2.12. Control of worker exposure: Manual, Transfer from/pouring from containers, Non-dedicated facility
Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Duration of the acitivity < 4 h
Technical and organisational conditions and measures		
Ensure material transfers are under containment or extract ventilation.		
Conditions and measures related to personal protection, hygiene and health evaluation		
Wear a respirator conforming to EN140 with Type A filter or better.		

2.2.13. Control of worker exposure: Drum/batch transfers, Dedicated facility
Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Technical and organisational conditions and measures
Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. Use drum pumps.

2.2.14. Control of worker exposure: Drum and small package filling, Dedicated facility
Transfer of substance or mixture into small containers (dedicated filling line, including weighing) (PROC9)

Technical and organisational conditions and measures
Fill containers/cans at dedicated fill points supplied with local extract ventilation.

2.2.15. Control of worker exposure: Equipment cleaning and maintenance, Non-dedicated facility
Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Duration of the acitivity < 1 h
Technical and organisational conditions and measures		
Drain down and flush system prior to equipment break-in or maintenance.		
Conditions and measures related to personal protection, hygiene and health evaluation		
Wear a respirator conforming to EN140 with Type A filter or better.		

2.2.16. Control of worker exposure: Storage, General exposures (closed systems)
Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Technical and organisational conditions and measures
No other specific measures identified.

2.2.17. Control of worker exposure: Storage, General exposures (closed systems), With sample collection
Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Duration of the acitivity < 1 h
Conditions and measures related to personal protection, hygiene and health evaluation		
Wear a respirator conforming to EN140 with Type A filter or better.		

2.3. Exposure estimation and reference to its source

2.3.1. Environmental release and exposure: Formulation into mixture (ERC2)

Release route	Release rate	Release estimation method
Air	0,025	ESVOC SPERC 1.1.v1
Water	0,005	ESVOC SPERC 1.1.v1
Soil	0,000	ESVOC SPERC 1.1.v1

Compartment	Exposure level	RCR
Sewage treatment plant	0,01 mg/L (EUSES)	0,001
Surface water	0,00144 mg/L (EUSES)	0,003
Freshwater sediment	0,00174 mg/kg wet weight (EUSES)	0,003
Marine water	0,000168 mg/L (EUSES)	0,010
Marine sediment	0,000201 mg/kg wet weight (EUSES)	0,010
Agricultural soil	0,118 mg/kg wet weight (EUSES)	0,491
Grassland	0,129 mg/kg wet weight (EUSES)	0,537

Additional information on exposure estimation
Risk from environmental exposure is driven by soil.

2.3.3. Worker exposure: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	0,042 mg/m³	< 0,01	
inhalative		short-term	0,17 mg/m³	< 0,01	
dermal			0,03 mg/kg/d	< 0,001	

2.3.4. Worker exposure: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	45 mg/m³	0,13	
inhalative		short-term	290 mg/m³	0,11	
dermal			0,82 mg/kg/d	< 0,001	

2.3.5. Worker exposure: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC3)

Exposure route	Health effect	Exposure	Exposure level	RCR	Remarks

		indicator			
inhalative		long-term	21 mg/m³	0,06	
inhalative		short-term	85 mg/m³	0,03	
dermal			0,07 mg/kg/d	< 0,001	

2.3.6. Worker exposure: Chemical production where opportunity for exposure arises (PROC4)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	43 mg/m³	0,12	
inhalative		short-term	170 mg/m³	0,06	
dermal			0,69 mg/kg/d	< 0,001	

2.3.7. Worker exposure: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC3)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	21 mg/m³	0,06	
inhalative		short-term	85 mg/m³	0,03	
dermal			0,07 mg/kg/d	< 0,001	

2.3.8. Worker exposure: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC3)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	21 mg/m³	0,06	
inhalative		short-term	85 mg/m³	0,03	
dermal			0,07 mg/kg/d	< 0,001	

2.3.9. Worker exposure: Use as laboratory reagent (PROC15)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	64 mg/m³	0,18	
inhalative		short-term	250 mg/m³	0,09	

dermal			0,34 mg/kg/d	< 0,001	

2.3.10. Worker exposure: Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	32 mg/m³	0,09	
inhalative		short-term	120 mg/m³	0,05	
dermal			0,69 mg/kg/d	< 0,001	

2.3.11. Worker exposure: Mixing or blending in batch processes (PROC5)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	64 mg/m³	0,18	
inhalative		short-term	420 mg/m³	0,15	
dermal			0,82 mg/kg/d	< 0,001	

2.3.12. Worker exposure: Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	64 mg/m³	0,18	
inhalative		short-term	420 mg/m³	0,15	
dermal			0,82 mg/kg/d	< 0,001	

2.3.13. Worker exposure: Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	32 mg/m³	0,09	
inhalative		short-term	120 mg/m³	0,05	
dermal			0,07 mg/kg/d	< 0,001	

2.3.14. Worker exposure: Transfer of substance or mixture into small containers (dedicated filling line, including weighing) (PROC9)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	85 mg/m³	0,24	
inhalative		short-term	340 mg/m³	0,12	
dermal			0,69 mg/kg/d	< 0,001	

2.3.15. Worker exposure: Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	21 mg/m³	0,06	
inhalative		short-term	420 mg/m³	0,15	
dermal			2,7 mg/kg/d	< 0,001	

2.3.16. Worker exposure: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	0,042 mg/m³	< 0,01	
inhalative		short-term	0,17 mg/m³	< 0,01	
dermal			0,03 mg/kg/d	< 0,001	

2.3.17. Worker exposure: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	21 mg/m³	0,06	
inhalative		short-term	420 mg/m³	0,15	
dermal			0,27 mg/kg/d	< 0,001	

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

Environment
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required.

Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).
Health
No data available

ES3: Distribution of substance

3.1. Title section

Structured Short Title	:	Use at industrial sites, Distribution of substance

Environment		
CS1	**Environment, transport**	ERC1, ERC2
CS2	**Environment, Storage**	ERC1, ERC2
Worker		
CS3	**General measures**	PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC9, PROC15
CS4	**General exposures (closed systems)**	PROC1
CS5	**General exposures (closed systems), With sample collection**	PROC2
CS6	**General exposures (closed systems), Use in contained batch processes, With sample collection**	PROC3
CS7	**General exposures (open systems), Batch process, With sample collection, Filling of equipment from drums or containers**	PROC4
CS8	**Process sampling**	PROC3
CS9	**Laboratory activities**	PROC15
CS10	**Bulk closed loading and unloading, Dedicated facility**	PROC8b
CS11	**Bulk open loading and unloading, Non-dedicated facility**	PROC8a
CS12	**Drum and small package filling, Dedicated facility**	PROC9
CS13	**Equipment cleaning and maintenance, Non-dedicated facility**	PROC8a
CS14	**Storage, General exposures (closed systems)**	PROC1
CS15	**Storage, General exposures (closed systems), With sample collection**	PROC2

3.2. Conditions of use affecting exposure

3.2.1. Control of environmental exposure: Manufacture of the substance (ERC1) / Formulation into mixture (ERC2)

Product (article) characteristics		
Covers percentage substance in the product up to 100 %.		
Vapour pressure	:	Liquid, vapour pressure > 10 kPa at Standard Temperature and Pressure
Amount used, frequency and duration of use (or from service life)		
Daily amount per site	:	49300 kg
Annual amount per site	:	18020 ton(s)/year
Release type	:	Continuous release
Emission days	:	365
Technical and organisational conditions and measures		
No air emission controls required; required removal efficiency is 0%.		
Soil emission controls are not applicable as there is no direct release to soil.		
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%): Water - minimum efficiency of > 97 %		
Prevent discharge of undissolved substance to or recover from onsite wastewater.		
Conditions and measures related to sewage treatment plant		
STP type	:	Onsite Sewage Treatment Plant
STP effluent	:	2.000 m³/d
STP type	:	Municipal Sewage Treatment Plant
STP effluent	:	2.000 m³/d
Estimated substance removal from wastewater via domestic sewage treatment: Water - minimum efficiency of 97 %		
Conditions and measures related to treatment of waste (including article waste)		
Waste treatment	:	External treatment and disposal of waste should comply with applicable local and/or national regulations. External recovery and recycling of waste should comply with

		applicable local and/or national regulations.
Other conditions affecting environmental exposure		
Local freshwater dilution factor	:	10
Local marine water dilution factor	:	100
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply		
None.		

3.2.2. Control of environmental exposure: Manufacture of the substance (ERC1) / Formulation into mixture (ERC2)

Product (article) characteristics		
Covers percentage substance in the product up to 100 %.		
Vapour pressure	:	Liquid, vapour pressure > 10 kPa at Standard Temperature and Pressure
Amount used, frequency and duration of use (or from service life)		
Annual amount per site	:	900000 ton(s)/year
Release type	:	Continuous release
Emission days	:	365
Technical and organisational conditions and measures		
No air emission controls required; required removal efficiency is 0%.		
Soil emission controls are not applicable as there is no direct release to soil.		
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%): Water - minimum efficiency of > 97 %		
Prevent discharge of undissolved substance to or recover from onsite wastewater.		
Conditions and measures related to sewage treatment plant		
STP type	:	Onsite Sewage Treatment Plant
STP effluent	:	2.000 m³/d
STP type	:	Municipal Sewage Treatment Plant
STP effluent	:	2.000 m³/d

Estimated substance removal from wastewater via domestic sewage treatment: Water - minimum efficiency of 97 %		
Conditions and measures related to treatment of waste (including article waste)		
Waste treatment	:	External treatment and disposal of waste should comply with applicable local and/or national regulations. External recovery and recycling of waste should comply with applicable local and/or national regulations.
Other conditions affecting environmental exposure		
Local freshwater dilution factor	:	10
Local marine water dilution factor	:	100
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply		
None.		

3.2.3. Control of worker exposure: General measures
Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1) / Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2) / Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC3) / Chemical production where opportunity for exposure arises (PROC4) / Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a) / Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b) / Transfer of substance or mixture into small containers (dedicated filling line, including weighing) (PROC9) / Use as laboratory reagent (PROC15)

Product (article) characteristics		
Covers percentage substance in the product up to 100 %.		
Vapour pressure	:	Liquid, vapour pressure > 10 kPa at Standard Temperature and Pressure
Amount used, frequency and duration of use (or from service life)		
Duration	:	Covers daily exposures up to 8 hours
Technical and organisational conditions and measures		
Common practices vary across sites thus conservative process release estimates used.		

Other conditions affecting workers exposure		
Indoor or outdoor use	:	Outdoor use
Temperature	:	Assumes use at not more than 20°C above ambient temperature.
Assumes a good basic standard of occupational hygiene is implemented		

3.2.4. Control of worker exposure: General exposures (closed systems)
Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Technical and organisational conditions and measures
No other specific measures identified.

3.2.5. Control of worker exposure: General exposures (closed systems), With sample collection
Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Duration of the acitivity < 4 h
Technical and organisational conditions and measures		
Ensure operation is undertaken outdoors.		
Conditions and measures related to personal protection, hygiene and health evaluation		
Wear a respirator conforming to EN140 with Type A filter or better.		

3.2.6. Control of worker exposure: General exposures (closed systems), Use in contained batch processes, With sample collection
Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC3)

Technical and organisational conditions and measures
Provide extract ventilation to points where emissions occur.

3.2.7. Control of worker exposure: General exposures (open systems), Batch process, With sample collection, Filling of equipment from drums or containers

Chemical production where opportunity for exposure arises (PROC4)

Technical and organisational conditions and measures
Provide extract ventilation to points where emissions occur. Ensure samples are obtained under containment or extract ventilation.

3.2.8. Control of worker exposure: Process sampling
Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC3)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Duration of the acitivity < 15 min
Conditions and measures related to personal protection, hygiene and health evaluation		
Wear a respirator conforming to EN140 with Type A filter or better.		

3.2.9. Control of worker exposure: Laboratory activities
Use as laboratory reagent (PROC15)

Technical and organisational conditions and measures
Provide a good standard of controlled ventilation (10 to 15 air changes per hour).

3.2.10. Control of worker exposure: Bulk closed loading and unloading, Dedicated facility
Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Duration of the acitivity < 1 h
Technical and organisational conditions and measures		
Ensure operation is undertaken outdoors.		
Conditions and measures related to personal protection, hygiene and health evaluation		
Wear a respirator conforming to EN140 with Type A filter or better.		

3.2.11. Control of worker exposure: Bulk open loading and unloading, Non-dedicated facility
Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Duration of the acitivity < 1 h
Technical and organisational conditions and measures		
Ensure material transfers are under containment or extract ventilation.		
Conditions and measures related to personal protection, hygiene and health evaluation		
Wear a respirator conforming to EN140 with Type A filter or better.		

3.2.12. Control of worker exposure: Drum and small package filling, Dedicated facility Transfer of substance or mixture into small containers (dedicated filling line, including weighing) (PROC9)

Technical and organisational conditions and measures
Fill containers/cans at dedicated fill points supplied with local extract ventilation.

3.2.13. Control of worker exposure: Equipment cleaning and maintenance, Non-dedicated facility Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Duration of the acitivity < 4 h
Technical and organisational conditions and measures		
Drain down and flush system prior to equipment break-in or maintenance.		
Conditions and measures related to personal protection, hygiene and health evaluation		
Wear a respirator conforming to EN140 with Type A filter or better.		

3.2.14. Control of worker exposure: Storage, General exposures (closed systems) Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Technical and organisational conditions and measures
No other specific measures identified.

3.2.15. Control of worker exposure: Storage, General exposures (closed systems), With sample collection
Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Duration of the acitivity < 1 h
Conditions and measures related to personal protection, hygiene and health evaluation		
Wear a respirator conforming to EN140 with Type A filter or better.		

3.3. Exposure estimation and reference to its source

3.3.1. Environmental release and exposure: Manufacture of the substance (ERC1) / Formulation into mixture (ERC2)

Release route	Release rate	Release estimation method
Air	0,000	ESVOC SPERC 3.22a.v1
Water	0,000	ESVOC SPERC 3.22a.v1
Soil	0,000	ESVOC SPERC 3.22a.v1

Compartment	Exposure level	RCR
Sewage treatment plant	0,00938 mg/L (EUSES)	0,001
Surface water	0,00162 mg/L (EUSES)	0,003
Freshwater sediment	0,00166 mg/kg wet weight (EUSES)	0,003
Marine water	0,000162 mg/L (EUSES)	0,010
Marine sediment	0,000194 mg/kg wet weight (EUSES)	0,010
Agricultural soil	0,00296 mg/kg wet weight (EUSES)	0,012
Grassland	0,000702 mg/kg wet weight (EUSES)	0,003

3.3.2. Environmental release and exposure: Manufacture of the substance (ERC1) / Formulation into mixture (ERC2)

Release route	Release rate	Release estimation method
Air	0 kg/day	ESVOC SPERC 3.22a.v1
Water	8,4 kg/day	ESVOC SPERC 3.22a.v1
Soil	0 kg/day	ESVOC SPERC 3.22a.v1

Compartment	Exposure level	RCR
Sewage treatment plant	0,00959 mg/L (EUSES)	0,001
Surface water	0,0014 mg/L (EUSES)	0,003
Freshwater sediment	0,00169 mg/kg wet weight (EUSES)	0,003
Marine water	0,000164 mg/L (EUSES)	0,010
Marine sediment	0,000196 mg/kg wet weight (EUSES)	0,010
Agricultural soil	0,0207 mg/kg wet weight (EUSES)	0,086
Grassland	0,00153 mg/kg wet weight (EUSES)	0,006

Additional information on exposure estimation
Risk from environmental exposure is driven by soil.

3.3.4. Worker exposure: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	0,042 mg/m³	< 0,01	
inhalative		short-term	0,17 mg/m³	< 0,01	
dermal			0,03 mg/kg/d	< 0,001	

3.3.5. Worker exposure: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	45 mg/m³	0,13	
inhalative		short-term	290 mg/m³	0,11	

dermal			0,82 mg/kg/d	< 0,001	

3.3.6. Worker exposure: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC3)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	21 mg/m³	0,06	
inhalative		short-term	85 mg/m³	0,03	
dermal			0,07 mg/kg/d	< 0,001	

3.3.7. Worker exposure: Chemical production where opportunity for exposure arises (PROC4)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	43 mg/m³	0,12	
inhalative		short-term	170 mg/m³	0,06	
dermal			0,69 mg/kg/d	< 0,001	

3.3.8. Worker exposure: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC3)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	21 mg/m³	0,06	
inhalative		short-term	850 mg/m³	0,3	
dermal			0,068 mg/kg/d	< 0,001	

3.3.9. Worker exposure: Use as laboratory reagent (PROC15)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	64 mg/m³	0,18	
inhalative		short-term	250 mg/m³	0,09	
dermal			0,34 mg/kg/d	< 0,001	

3.3.10. Worker exposure: Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	89 mg/m³	0,25	
inhalative		short-term	1,7 g/m³	0,64	
dermal			2,7 mg/kg/d	< 0,001	

3.3.11. Worker exposure: Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	21 mg/m³	0,06	
inhalative		short-term	420 mg/m³	0,15	
dermal			0,27 mg/kg/d	< 0,001	

3.3.12. Worker exposure: Transfer of substance or mixture into small containers (dedicated filling line, including weighing) (PROC9)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	85 mg/m³	0,24	
inhalative		short-term	340 mg/m³	0,12	
dermal			0,69 mg/kg/d	< 0,001	

3.3.13. Worker exposure: Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	64 mg/m³	0,18	
inhalative		short-term	420 mg/m³	0,15	
dermal			8,2 mg/kg/d	0,001	

3.3.14. Worker exposure: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	0,042 mg/m³	< 0,01	
inhalative		short-term	0,17 mg/m³	< 0,01	

dermal			0,03 mg/kg/d	< 0,001	

3.3.15. Worker exposure: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	21 mg/m³	0,06	
inhalative		short-term	420 mg/m³	0,15	
dermal			0,27 mg/kg/d	< 0,001	

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

Environment
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required.
Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).
Health
No data available

ES4: Use in fuel

4.1. Title section

Structured Short Title	:	Use at industrial sites, Use in fuel

Environment		
CS1	**Environment**	ERC6b
Worker		
CS2	**General measures applicable to all activities**	PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC16
CS3	**Bulk transfers, Batch process, With sample collection, Filling of equipment from drums or containers**	PROC8b
CS4	**Drum/batch transfers, Filling of equipment from drums or containers, Bulk transfers, Dedicated facility**	PROC8b
CS5	**General exposures (closed systems)**	PROC1
CS6	**General exposures (closed systems), With sample collection**	PROC2
CS7	**General exposures (closed systems), Use in contained batch processes, With sample collection**	PROC3
CS8	**Use in fuel, Closed systems**	PROC16
CS9	**Batch process, Closed systems**	PROC3
CS10	**Equipment cleaning and maintenance, Non-dedicated facility, e.g. fuel pump repair indoor**	PROC8a
CS11	**Storage, General exposures (closed systems)**	PROC1
CS12	**Storage, General exposures (closed systems), With sample collection**	PROC2

4.2. Conditions of use affecting exposure

4.2.1. Control of environmental exposure: Use of reactive processing aid at industrial site (no inclusion into or onto article) (ERC6b)

Product (article) characteristics		
Vapour pressure	:	Liquid, vapour pressure > 10 kPa at Standard Temperature and Pressure
Amount used, frequency and duration of use (or from service life)		
Daily amount per site	:	51400 kg
Annual amount per site	:	18020 ton(s)/year
Release type	:	Continuous release
Emission days	:	350
Technical and organisational conditions and measures		
No air emission controls required; required removal efficiency is 0%.		
Soil emission controls are not applicable as there is no direct release to soil.		
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%): Water - minimum efficiency of > 95 %		
Prevent discharge of undissolved substance to or recover from onsite wastewater.		
Conditions and measures related to sewage treatment plant		
STP type	:	Onsite Sewage Treatment Plant
STP effluent	:	2.000 m³/d
STP type	:	Municipal Sewage Treatment Plant
STP effluent	:	2.000 m³/d
Estimated substance removal from wastewater via domestic sewage treatment: Water - minimum efficiency of 95 %		
Conditions and measures related to treatment of waste (including article waste)		
Waste treatment	:	This substance is consumed during use and no waste of the substance is generated.
Other conditions affecting environmental exposure		

Local freshwater dilution factor	:	10
Local marine water dilution factor	:	100
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply		
None.		

4.2.2. Control of worker exposure: General measures applicable to all activities
Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1) / Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2) / Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC3) / Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a) / Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b) / Use of fuels (PROC16)

Product (article) characteristics		
Covers concentrations up to 15 %		
Vapour pressure	:	Liquid, vapour pressure > 10 kPa at Standard Temperature and Pressure
Amount used, frequency and duration of use (or from service life)		
Duration	:	Covers daily exposures up to 8 hours
Technical and organisational conditions and measures		
Common practices vary across sites thus conservative process release estimates used.		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Outdoor use
Temperature	:	Assumes use at not more than 20°C above ambient temperature.
Assumes a good basic standard of occupational hygiene is implemented		

4.2.3. Control of worker exposure: Bulk transfers, Batch process, With sample collection, Filling of equipment from drums or containers
Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Duration of the acitivity < 4 h
Technical and organisational conditions and measures		
Use vapour recovery units when necessary.		
Conditions and measures related to personal protection, hygiene and health evaluation		
Wear a respirator conforming to EN140 with Type A filter or better.		

4.2.4. Control of worker exposure: Drum/batch transfers, Filling of equipment from drums or containers, Bulk transfers, Dedicated facility
Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Technical and organisational conditions and measures
Use drum pumps.

4.2.5. Control of worker exposure: General exposures (closed systems)
Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Technical and organisational conditions and measures
No other specific measures identified.

4.2.6. Control of worker exposure: General exposures (closed systems), With sample collection
Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2)

Technical and organisational conditions and measures
Provide extract ventilation to material transfer points and other openings.

4.2.7. Control of worker exposure: General exposures (closed systems), Use in contained batch processes, With sample collection
Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC3)

Technical and organisational conditions and measures

Provide extract ventilation to points where emissions occur.

4.2.8. Control of worker exposure: Use in fuel, Closed systems
Use of fuels (PROC16)

Technical and organisational conditions and measures
No other specific measures identified.

4.2.9. Control of worker exposure: Batch process, Closed systems
Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC3)

Technical and organisational conditions and measures
Provide extract ventilation to material transfer points and other openings.

4.2.10. Control of worker exposure: Equipment cleaning and maintenance, Non-dedicated facility, e.g. fuel pump repair indoor
Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Duration of the acitivity < 4 h
Technical and organisational conditions and measures		
Drain down and flush system prior to equipment break-in or maintenance.		

4.2.11. Control of worker exposure: Storage, General exposures (closed systems)
Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Technical and organisational conditions and measures
No other specific measures identified.

4.2.12. Control of worker exposure: Storage, General exposures (closed systems), With sample collection
Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2)

Technical and organisational conditions and measures
Ensure operation is undertaken outdoors.

4.3. Exposure estimation and reference to its source

4.3.1. Environmental release and exposure: Use of reactive processing aid at industrial site (no inclusion into or onto article) (ERC6b)

Release route	Release rate	Release estimation method
Air	0,003	
Water	0,000	
Soil	0	

Compartment	Exposure level	RCR
Sewage treatment plant	0,00909 mg/L (EUSES)	0,001
Surface water	0,00135 mg/L (EUSES)	0,003
Freshwater sediment	0,00163 mg/L (EUSES)	0,003
Marine water	0,000159 mg/L (EUSES)	0,010
Marine sediment	0,00019 mg/kg wet weight (EUSES)	0,010
Agricultural soil	0,0058 mg/kg wet weight (EUSES)	0,024
Grassland	0,00511 mg/kg wet weight (EUSES)	0,021

Additional information on exposure estimation
Risk from environmental exposure is driven by soil.

4.3.3. Worker exposure: Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	46 mg/m³	0,13	

inhalative		short-term	300 mg/m³	0,11	
dermal			4,9 mg/kg/d	< 0,001	

4.3.4. Worker exposure: Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	77 mg/m³	0,22	
inhalative		short-term	300 mg/m³	0,11	
dermal			8,2 mg/kg/d	0,001	

4.3.5. Worker exposure: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	0,025 mg/m³	< 0,01	
inhalative		short-term	0,1 mg/m³	< 0,01	
dermal			0,018 mg/kg/d	< 0,001	

4.3.6. Worker exposure: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	6,3 mg/m³	0,02	
inhalative		short-term	26 mg/m³	0,01	
dermal			0,08 mg/kg/d	< 0,001	

4.3.7. Worker exposure: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC3)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	13 mg/m³	0,04	
inhalative		short-term	51 mg/m³	0,02	
dermal			0,04 mg/kg/d	< 0,001	

4.3.8. Worker exposure: Use of fuels (PROC16)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	64 mg/m³	0,18	
inhalative		short-term	250 mg/m³	0,09	
dermal			0,2 mg/kg/d	< 0,001	

4.3.9. Worker exposure: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC3)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	13 mg/m³	0,04	
inhalative		short-term	51 mg/m³	0,02	
dermal			0,04 mg/kg/d	0,001	

4.3.10. Worker exposure: Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	38 mg/m³	0,11	
inhalative		short-term	250 mg/m³	0,09	
dermal			4,9 mg/kg/d	< 0,001	

4.3.11. Worker exposure: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	0,025 mg/m³	< 0,01	
inhalative		short-term	0,1 mg/m³	< 0,01	
dermal			0,018 mg/kg/d	< 0,001	

4.3.12. Worker exposure: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks

inhalative		long-term	45 mg/m³	0,13	
inhalative		short-term	170 mg/m³	0,06	
dermal			0,82 mg/kg/d	< 0,001	

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

Environment
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.
If scaling reveals a condition of unsafe use (i.e., RCRs > 1), additional RMMs or a site-specific chemical safety assessment is required.
Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).
Health
No data available

ES5: Use in fuel

5.1. Title section

Structured Short Title	:	Widespread use by professional workers, Use in fuel

Environment		
CS1	**Environment**	ERC8b, ERC8e
Worker		
CS2	**General measures**	PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC9, PROC16
CS3	**Bulk transfers, Batch process, Filling of equipment from drums or containers**	PROC8b
CS4	**Drum/batch transfers, Filling of equipment from drums or containers**	PROC8b
CS5	**Refuelling**	PROC8b
CS6	**General exposures (closed systems), With sample collection**	PROC2
CS7	**General exposures (closed systems), Use in contained batch processes, With sample collection**	PROC3
CS8	**Drum and small package filling, Dedicated facility**	PROC9
CS9	**Use of fuel, Closed systems**	PROC16
CS10	**Equipment cleaning and maintenance, Non-dedicated facility, e.g. fuel pump repair indoor**	PROC8a
CS11	**Equipment cleaning and maintenance, Non-dedicated facility, e.g fuel pump repair outdoor**	PROC8a
CS12	**Storage, General exposures (closed systems)**	PROC1

5.2. Conditions of use affecting exposure

5.2.1. Control of environmental exposure: Widespread use of reactive processing aid (no inclusion into or onto article, indoor) (ERC8b) / Widespread use of reactive processing aid (no inclusion into or onto article, outdoor) (ERC8e)

Product (article) characteristics		
Vapour pressure	:	Liquid, vapour pressure > 10 kPa at Standard Temperature and Pressure
Amount used, frequency and duration of use (or from service life)		
Daily amount for wide dispersive uses	:	4,94 kg
Annual amount per site	:	1,8 ton(s)/year
Release type	:	Continuous release
Emission days	:	365
Technical and organisational conditions and measures		
No air emission controls required; required removal efficiency is 0%.		
Soil emission controls are not applicable as there is no direct release to soil.		
Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%): Water - minimum efficiency of > 95 %		
Prevent discharge of undissolved substance to or recover from onsite wastewater.		
Conditions and measures related to sewage treatment plant		
STP type	:	Municipal Sewage Treatment Plant
STP effluent	:	2.000 m³/d
Estimated substance removal from wastewater via domestic sewage treatment: Water - minimum efficiency of 95 %		
Conditions and measures related to treatment of waste (including article waste)		
Waste treatment	:	External treatment and disposal of waste should comply with applicable local and/or national regulations. External recovery and recycling of waste should comply with applicable local and/or national regulations.

Other conditions affecting environmental exposure		
Local freshwater dilution factor	:	10
Local marine water dilution factor	:	100
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply		
None.		

5.2.2. Control of worker exposure: General measures
Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1) / Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2) / Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC3) / Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a) / Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b) / Transfer of substance or mixture into small containers (dedicated filling line, including weighing) (PROC9) / Use of fuels (PROC16)

Product (article) characteristics		
Covers concentrations up to 15 %		
Vapour pressure	:	Liquid, vapour pressure > 10 kPa at Standard Temperature and Pressure
Amount used, frequency and duration of use (or from service life)		
Duration	:	Covers daily exposures up to 8 hours
Technical and organisational conditions and measures		
Common practices vary across sites thus conservative process release estimates used.		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Outdoor use
Temperature	:	Assumes use at not more than 20°C above ambient temperature.
Assumes a good basic standard of occupational hygiene is implemented		

5.2.3. Control of worker exposure: Bulk transfers, Batch process, Filling of equipment from drums or containers

Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Duration of the acitivity < 4 h
Technical and organisational conditions and measures		
Ensure operation is undertaken outdoors.		
Conditions and measures related to personal protection, hygiene and health evaluation		
Wear a respirator conforming to EN140 with Type A filter or better.		

5.2.4. Control of worker exposure: Drum/batch transfers, Filling of equipment from drums or containers
Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Technical and organisational conditions and measures
Use vapour recovery units when necessary. Ensure material transfers are under containment or extract ventilation.

5.2.5. Control of worker exposure: Refuelling
Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Duration of the acitivity < 1 h
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (10 to 15 air changes per hour).		
Conditions and measures related to personal protection, hygiene and health evaluation		
Wear a respirator conforming to EN140 with Type A filter or better.		

5.2.6. Control of worker exposure: General exposures (closed systems), With sample collection Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2)

Amount used, frequency and duration of use (or from service life)

Duration	:	Duration of the acitivity < 4 h

Conditions and measures related to personal protection, hygiene and health evaluation
Wear a respirator conforming to EN140 with Type A filter or better.

5.2.7. Control of worker exposure: General exposures (closed systems), Use in contained batch processes, With sample collection
Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC3)

Technical and organisational conditions and measures
Provide a good standard of controlled ventilation (10 to 15 air changes per hour).

5.2.8. Control of worker exposure: Drum and small package filling, Dedicated facility
Transfer of substance or mixture into small containers (dedicated filling line, including weighing) (PROC9)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Duration of the acitivity < 4 h

Technical and organisational conditions and measures
Use drum pumps or carefully pour from container.

Conditions and measures related to personal protection, hygiene and health evaluation
Wear a respirator conforming to EN140 with Type A filter or better.

5.2.9. Control of worker exposure: Use of fuel, Closed systems
Use of fuels (PROC16)

Technical and organisational conditions and measures
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Ensure operation is undertaken outdoors.

5.2.10. Control of worker exposure: Equipment cleaning and maintenance, Non-dedicated facility, e.g. fuel pump repair indoor
Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Duration of the acitivity < 4 h
Technical and organisational conditions and measures		
Drain down system prior to equipment break-in or maintenance.		
Conditions and measures related to personal protection, hygiene and health evaluation		
Wear a respirator conforming to EN140 with Type A filter or better.		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor

5.2.11. Control of worker exposure: Equipment cleaning and maintenance, Non-dedicated facility, e.g fuel pump repair outdoor
Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Duration of the acitivity < 4 h
Technical and organisational conditions and measures		
Drain down system prior to equipment break-in or maintenance.		
Conditions and measures related to personal protection, hygiene and health evaluation		
Wear a respirator conforming to EN140 with Type A filter or better.		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Outdoor

5.2.12. Control of worker exposure: Storage, General exposures (closed systems)
Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Technical and organisational conditions and measures
No other specific measures identified.

5.3. Exposure estimation and reference to its source

5.3.1. Environmental release and exposure: Widespread use of reactive processing aid (no inclusion into or onto article, indoor) (ERC8b) / Widespread use of reactive processing aid (no inclusion into or onto article, outdoor) (ERC8e)

Release route	Release rate	Release estimation method
Air	0,01	
Water	0,000	
Soil	0,000	

Compartment	Exposure level	RCR
Sewage treatment plant	0,00248 mg/L (EUSES)	0,000
Surface water	0,000692 mg/L (EUSES)	0,001
Freshwater sediment	0,000819 mg/kg wet weight (EUSES)	0,001
Marine water	0,0000933 mg/L (EUSES)	0,005
Marine sediment	0,00011 mg/kg wet weight (EUSES)	0,006
Agricultural soil	0,000908 mg/kg wet weight (EUSES)	0,004
Grassland	0,000667 mg/kg wet weight (EUSES)	0,003

Additional information on exposure estimation
Risk from environmental exposure is driven by soil.

5.3.3. Worker exposure: Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	260 mg/m³	0,76	
inhalative		short-term	1,7 g/m³	0,99	
dermal			4,9 mg/kg/d	< 0,001	

5.3.4. Worker exposure: Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	120 mg/m³	0,36	
inhalative		short-term	510 mg/m³	0,28	
dermal			8,2 mg/kg/d	0,001	

5.3.5. Worker exposure: Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	38 mg/m³	0,11	
inhalative		short-term	760 mg/m³	0,43	
dermal			1,6 mg/kg/d	< 0,001	

5.3.6. Worker exposure: Chemical production or refinery in closed continuous process with occasional controlled exposure or processes with equivalent containment conditions (PROC2)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	77 mg/m³	0,22	
inhalative		short-term	510 mg/m³	0,28	
dermal			0,49 mg/kg/d	< 0,001	

5.3.7. Worker exposure: Manufacture or formulation in the chemical industry in closed batch processes with occasional controlled exposure or processes with equivalent containment condition (PROC3)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	77 mg/m³	0,22	
inhalative		short-term	300 mg/m³	0,17	
dermal			0,41 mg/kg/d	< 0,001	

5.3.8. Worker exposure: Transfer of substance or mixture into small containers (dedicated filling line, including weighing) (PROC9)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks

inhalative		long-term	77 mg/m³	0,22	
inhalative		short-term	510 mg/m³	0,28	
dermal			2,4 mg/kg/d	< 0,001	

5.3.9. Worker exposure: Use of fuels (PROC16)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	89 mg/m³	0,25	
inhalative		short-term	350 mg/m³	0,2	
dermal			0,2 mg/kg/d	< 0,001	

5.3.10. Worker exposure: Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	150 mg/m³	0,43	
inhalative		short-term	1,0 g/m³	0,57	
dermal			4,9 mg/kg/d	< 0,001	

5.3.11. Worker exposure: Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	150 mg/m³	0,43	
inhalative		short-term	1,0 g/m³	0,57	
dermal			4,9 mg/kg/d	< 0,001	

5.3.12. Worker exposure: Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		long-term	0,025 mg/m³	< 0,01	
inhalative		short-term	0,1 mg/m³	< 0,01	
dermal			0,018 mg/kg/d	< 0,001	

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

Environment
Not applicable for wide dispersive uses.
Further details on scaling and control technologies are provided in SpERC factsheet (http://cefic.org/en/reach-for-industries-libraries.html).
Health
No data available

ES6: Use in fuels

6.1. Title section

Structured Short Title	:	Consumer use, Use in fuels

Environment		
CS1	**Environment**	ERC8b, ERC8e
Consumer		
CS2	**Use of fuel**	PC13

6.2. Conditions of use affecting exposure

6.2.1. Control of environmental exposure: Widespread use of reactive processing aid (no inclusion into or onto article, indoor) (ERC8b) / Widespread use of reactive processing aid (no inclusion into or onto article, outdoor) (ERC8e)

Product (article) characteristics		
Covers concentrations up to 15		
Amount used, frequency and duration of use (or from service life)		
For each use event, covers use amounts up to	:	37,5 kg
Conditions and measures related to treatment of waste (including article waste)		
Waste treatment	:	This substance is consumed during use and no waste of the substance is generated.
Conditions and measures related to sewage treatment plant		
STP type	:	Municipal sewage treatment plant
STP effluent	:	2.000 m³/d

Other conditions affecting environmental exposure		
Local freshwater dilution factor	:	10
Local marine water dilution factor	:	100
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply		
None.		

6.2.2. Control of consumer exposure: Use of fuel
Fuels (PC13)

Product (article) characteristics		
Covers concentrations up to 15 %		
Vapour pressure	:	Liquid, vapour pressure > 10 kPa at Standard Temperature and Pressure
Amount used, frequency and duration of use (or from service life)		
For each use event, covers use amounts up to	:	37,5 kg
Use frequency	:	Covers use up to 150 times per year
Use frequency	:	Covers use up to 15 min/event
Other conditions affecting consumers exposure		
Body parts exposed	:	Covers skin contact area up to 210 cm2 (unless stated differently).
Indoor or outdoor use	:	Outdoor use
Temperature	:	Assumes use at not more than 20°C above ambient temperature.

6.3. Exposure estimation and reference to its source

6.3.1. Environmental release and exposure: Widespread use of reactive processing aid (no inclusion into or onto article, indoor) (ERC8b) / Widespread use of reactive processing aid (no inclusion into or onto article, outdoor) (ERC8e)

Compartment	**Exposure level**	**RCR**

Sewage treatment plant	0,00248 mg/L	0,000
Surface water	0,000692 mg/L	0,001
Freshwater sediment	0,000819 mg/kg wet weight	0,001
Marine water	0,0000933 mg/L	0,005
Marine sediment	0,00011 mg/kg wet weight	0,006
Agricultural soil	0,000908 mg/kg wet weight	0,004
Grassland	0,000667 mg/kg wet weight	0,003

Additional information on exposure estimation
Risk from environmental exposure is driven by marine sediment.

6.3.2. Consumer exposure: Fuels (PC13)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative		short-term	29 mg/m³	0,017	
inhalative		Chronic exposure	0,026 mg/m³	0,000	
dermal	systemic	Chronic exposure	0,011 mg/kg bw/day	0,000	

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

Health
No data available
Environment
Not applicable for wide dispersive uses.