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

1.1 Product identifier

Trade name	:	Carbon Black Feedstock, CBFS
REACH Registration Number	:	01-2119485585-24-0004 (Borealis AB)
EC-No.	:	265-193-8

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

Use of the Substance/Mixture	:	Manufacture, Use as an intermediate, Formulation, Fuel use - Industrial, Use in functional fluids, Fuel use - Professional

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

+1 760 476 3962 (3E), Access code: 336296

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification (REGULATION (EC) No 1272/2008)

Skin irritation, Category 2	H315: Causes skin irritation.
Germ cell mutagenicity, Category 1B	H340: May cause genetic defects.
Carcinogenicity, Category 1A	H350: May cause cancer.
Long-term (chronic) aquatic hazard, Category 2	H411: Toxic to aquatic life with long lasting effects.

2.2 Label elements

Labelling (REGULATION (EC) No 1272/2008)

Hazard pictograms :

Signal word : Danger

Hazard statements :
H315 Causes skin irritation.
H340 May cause genetic defects.
H350 May cause cancer.
H411 Toxic to aquatic life with long lasting effects.

Precautionary statements :

Prevention:

P201 Obtain special instructions before use.
P273 Avoid release to the environment.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection/ hearing protection.

Response:

P308 + P313 IF exposed or concerned: Get medical advice/ attention.
P370 + P378 In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P391 Collect spillage.

Additional Labelling

Restricted to professional users.

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.

SECTION 3: Composition/information on ingredients

The product is a heavy fuel oil: complex combination of hydrocarbons obtained as the residual fraction from the distillation of the products of a steam cracking process (including steam cracking to produce ethylene). It consists predominantly of unsaturated hydrocarbons having carbon numbers predominantly greater than C14 and boiling above approximately 260°C (500°F). This stream is likely to contain 5 wt. % or more of 4- to 6-membered condensed ring aromatic hydrocarbons.

3.1 Substances

EC-No. : 265-193-8

Components

Chemical name	CAS-No. EC-No.	Concentration (% w/w)	M-Factor, SCL, ATE
Substance of unknown or variable composition, complex reaction products or biological material (UVCB) :			
Residues (petroleum), steam-cracked; Heavy Fuel oil	64742-90-1 265-193-8	<= 100	
Contains :			
naphthalene	91-20-3 202-049-5	>= 5 - < 20	
toluene	108-88-3 203-625-9	>= 0 - < 1	
benzene	71-43-2 200-753-7	>= 0 - <= 0,5	

SECTION 4: First aid measures

4.1 Description of first aid measures

General advice : Move out of dangerous area.
Take off contaminated clothing and shoes immediately.
Do not leave the victim unattended.
Immediate medical attention is required.

First aider needs to protect himself.
For personal protection see section 8.

If inhaled : Move to fresh air.
Consult a physician if necessary.

In case of skin contact : Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes.

Cool skin rapidly with cold water after contact with hot material.
Seek medical advice immediately.

In case of eye contact : Rinse thoroughly with plenty of water, also under the eyelids.
If easy to do, remove contact lens, if worn.
Protect unharmed eye.
Get medical attention if irritation develops and persists.

If swallowed : Rinse mouth with water.
Immediately give plenty of water (if possible charcoal slurry).
Do not give milk or alcoholic beverages.
Do NOT induce vomiting.
If a person vomits when lying on his back, place him in the recovery position.
Never give anything by mouth to an unconscious person.

4.2 Most important symptoms and effects, both acute and delayed

Symptoms : May irritate skin.
May irritate eyes.
Repeated exposure may cause skin dryness or cracking.

Inhalation of high vapour concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting.

Risks : Components of the product may be absorbed into the body by inhalation, ingestion and through the skin.
Causes skin irritation.
May cause genetic defects.
May cause cancer.

4.3 Indication of any immediate medical attention and special treatment needed

Treatment : Treat symptomatically.
Symptoms may be delayed.
Keep under medical supervision.
For specialist advice physicians should contact the Poisons Information Service.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media : Dry powder
Carbon dioxide (CO2)
Foam
Water mist

Unsuitable extinguishing media	:	High volume water jet

5.2 Special hazards arising from the substance or mixture

Specific hazards during firefighting	:	Fire will produce dense black smoke containing hazardous combustion products (see section 10). Vapours may form explosive mixtures with air. Do not allow run-off from fire fighting to enter drains or water courses.

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. The product is flammable but not readily ignited. Cool containers/tanks with water spray.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Keep people away from and upwind of spill/leak.
Attempt to stop leakage without personal risk.
Ensure adequate ventilation, especially in confined areas.
Use personal protective equipment.
See chapter 8.

6.2 Environmental precautions

Prevent product from entering environment and drains.
If major spillage occurs, contact the proper local authorities.

6.3 Methods and material for containment and cleaning up

Soak up with inert absorbent material and dispose of as hazardous waste.
Large amounts:
Dam up.

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 : Avoid exposure - obtain special instructions before use.
Take precautionary measures against static discharges.
To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded.
The following actions are recommended: Closed systems for handling, process and storage.
Ensure adequate ventilation.
Keep away from sources of ignition - No smoking.
Ensure that eyewash stations and safety showers are close to the workstation location.

Advice on protection against fire and explosion : Keep away from heat and sources of ignition. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas. Take precautionary measures against static discharges. To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded.

Hygiene measures : Smoking, eating and drinking should be prohibited in the application area. Wash face, hands and any exposed skin thoroughly after handling. Wash contaminated clothing before re-use. Keep working clothes separately.

7.2 Conditions for safe storage, including any incompatibilities

Requirements for storage areas and containers : Keep locked up or in an area accessible only to qualified or authorised persons. Keep container tightly closed and in a well-ventilated place.

Advice on common storage : Keep away from food, drink and animal feedingstuffs.

7.3 Specific end use(s)

Specific use(s) : Not applicable

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational Exposure Limits

Components	CAS-No.	Value type (Form of exposure)	Control parameters	Basis
naphthalene	91-20-3	TWA	10 ppm 50 mg/m3	91/322/EEC
Further information	Indicative			

toluene	108-88-3	TWA	50 ppm 192 mg/m3	2006/15/EC
Further information	Indicative, Identifies the possibility of significant uptake through the skin			
		STEL	100 ppm 384 mg/m3	2006/15/EC
Further information	Indicative, Identifies the possibility of significant uptake through the skin			
benzene	71-43-2	TWA	0,5 ppm 1,65 mg/m3	2004/37/EC
Further information	Skin, Carcinogens or mutagens			

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

Substance name	End Use	Exposure routes	Potential health effects	Value
naphthalene	Workers	Skin contact	Long-term systemic effects	72 mg/kg bw/d
	Workers	Inhalation	Long-term systemic effects	50 mg/m3
toluene	Workers	Skin contact	Long-term systemic effects	384 mg/kg bw/d
	Workers	Inhalation	Long-term systemic effects	192 mg/m3
benzene	Workers	Inhalation	Long-term systemic effects	0,8 mg/m3
Remarks:	Derived minimal effect level			
	Consumers	Inhalation	Long-term systemic effects	0,14 mg/m3
Remarks:	Derived minimal effect level			

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

Substance name	Environmental Compartment	Value
benzene	Fresh water	80 µg/l
	Fresh water	53 µg/l
Remarks:	Intermittent use/release	
	Marine water	8 µg/l
	Marine water	5,3 µg/l
	Intermittent use/release	
	Fresh water sediment	1,36 mg/kg dwt
	Marine sediment	0,136 mg/kg dwt
	Sewage treatment plant	39 mg/l
	Soil	0,225 mg/kg dwt

8.2 Exposure controls

Engineering measures

Minimise exposure using measures such as closed systems, dedicated facilities and suitable general / local exhaust ventilation.
Ensure safe systems of work or equivalent arrangements are in place to manage risks.
Regularly inspect, test and maintain all control measures.

Personal protective equipment

Eye protection	:	Safety glasses with side-shields conforming to EN166 If splashes are likely to occur, wear: Face-shield
Hand protection		
Material	:	Impervious gloves
Material	:	Nitrile rubber
Break through time	:	10 min
Remarks	:	Protective gloves complying with EN 374. 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. When handling hot material, use heat resistant gloves.
Skin and body protection	:	Wear suitable protective clothing and rubber boots.
Respiratory protection	:	In case of insufficient ventilation: Respirator with A2 or ABEK filter or self-contained breathing apparatus.
Protective measures	:	Avoid and prevent all spillage, contact and exposure. Consider the need for risk based health surveillance.

Environmental exposure controls

General advice	:	Prevent product from entering environment and drains. If major spillage occurs, contact the proper local authorities.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Physical state	:	viscous liquid, (hot)
Colour	:	black
Odour	:	aromatic
Melting range	:	-63 - 43 °C
Boiling range	:	72 - 390 °C
Upper explosion limit / Upper flammability limit	:	No data available
Lower explosion limit / Lower flammability limit	:	No data available
Flash point	:	65 - 145 °C
Auto-ignition temperature	:	> 320 °C

Viscosity		
Viscosity, dynamic	:	215 mPa.s (40 °C)
Viscosity, kinematic	:	36,07 mm²/s (40 °C)
Solubility(ies)		
Water solubility	:	25 - 41 mg/l
Partition coefficient: n-octanol/water	:	log Pow: 3,0 - 6,5
Vapour pressure	:	2 - 26 hPa (20 °C)
Relative density	:	1,07
Density	:	1.050 g/cm³

9.2 Other information

Explosives	:	Not applicable
Oxidizing properties	:	Not applicable
Self-ignition	:	453 - 480 °C
Molecular weight	:	Not applicable

SECTION 10: Stability and reactivity

10.1 Reactivity

No dangerous reaction known under conditions of normal use.

10.2 Chemical stability

No decomposition if stored and applied as directed.

10.3 Possibility of hazardous reactions

Hazardous reactions : Vapours may form explosive mixtures with air.

10.4 Conditions to avoid

Conditions to avoid : Keep away from heat and sources of ignition.

10.5 Incompatible materials

Materials to avoid : Oxidizing agents

10.6 Hazardous decomposition products

Under fire conditions:
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 (Rat): > 2.000 mg/kg Method: OECD Test Guideline 401 Remarks: Read-across (Analogy)
Acute inhalation toxicity	:	LC50 (Rat): > 1,6 mg/l Exposure time: 7 h Test atmosphere: vapour Method: OECD Test Guideline 403 Remarks: Read-across (Analogy)
Acute dermal toxicity	:	LD50 (Rat): > 2.000 mg/kg Method: OECD Test Guideline 402 Remarks: Read-across (Analogy)

Skin corrosion/irritation

Causes skin irritation.

Product:

Species	:	Rabbit
Assessment	:	Irritating to skin.
Remarks	:	Read-across (Analogy)

Serious eye damage/eye irritation

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

Product:

Species	:	Rabbit
Assessment	:	No eye irritation
Remarks	:	Read-across (Analogy)

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:

Test Type	:	Buehler Test
Species	:	Guinea pig
Result	:	Did not cause sensitisation on laboratory animals.
Remarks	:	Read-across (Analogy)

Germ cell mutagenicity

May cause genetic defects.

Product:

Genotoxicity in vitro	:	Result: Conflicting results have been seen in different studies.
Germ cell mutagenicity-Assessment	:	(Benzene ≥ 0,1 wt-%)

Components:

benzene:

Genotoxicity in vitro	:	Test Type: Ames test Metabolic activation: with and without metabolic activation Method: OECD Test Guideline 471 Result: negative
	:	Test Type: Chromosome aberration test in vitro Metabolic activation: with and without metabolic activation Result: positive
Genotoxicity in vivo	:	Test Type: In vivo micronucleus test Species: Mouse Application Route: inhalation (vapour) Method: OECD Test Guideline 474 Result: positive Species: Human Result: Positive results were obtained in some in vivo tests.

Carcinogenicity

May cause cancer.

Product:

Remarks	:	Information given is based on data of the components.
Carcinogenicity - Assessment	:	(Benzene ≥ 0,1 wt-%)

Components:

benzene:

Species	:	Rat, male and female
Application Route	:	Oral
Exposure time	:	103 wks
Dose	:	25 mg/kg bw/d
Frequency of Treatment	:	1/d, 5 d/wk
Method	:	OECD Test Guideline 453

Species	:	Mouse, male and female
Application Route	:	Inhalation
Exposure time	:	2 - 16 wks
Dose	:	960 mg/m3
Frequency of Treatment	:	6 h/d, 5 d/wk

Reproductive toxicity

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

STOT - single exposure

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

STOT - repeated exposure

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

Repeated dose toxicity

Product:

Remarks	:	The substance or mixture is not classified as specific target organ toxicant, repeated exposure. Information given is based on data of the components.

Aspiration toxicity

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

Product:

No aspiration toxicity classification

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.

Further information

Product:

Remarks	:	Experiences with human exposure: Naphthalene may have effects on the blood cells. This may result in haemolytic anaemia.

SECTION 12: Ecological information

12.1 Toxicity

Product:

Toxicity to fish	:	LL50 (Oncorhynchus mykiss (rainbow trout)): 32 mg/l Exposure time: 96 h Test substance: Read-across (Analogy) Method: OECD Test Guideline 203
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia (water flea)): > 4,58 mg/l Exposure time: 48 h Test Type: static test Test substance: Read-across (Analogy) Method: OECD Test Guideline 202 Remarks: Fresh water
Toxicity to algae/aquatic plants	:	ErC50 (algae): > 2,1 mg/l Exposure time: 96 h Test Type: Growth inhibition Test substance: Read-across (Analogy) Method: OECD Test Guideline 201 Remarks: Fresh water
Toxicity to fish (Chronic toxicity)	:	EC10: 0,0445 mg/l Method: QSAR
Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity)	:	EC10: 0,0787 mg/l Exposure time: 21 d Species: Daphnia (water flea) Method: QSAR

Ecotoxicology Assessment

Short-term (acute) aquatic hazard	:	Toxic to aquatic organisms.
Long-term (chronic) aquatic hazard	:	May cause long-term adverse effects in the aquatic environment.

Components:

benzene:

Toxicity to fish (Chronic toxicity)	:	LOEC: 1,6 mg/l Exposure time: 32 d Species: Pimephales promelas (fathead minnow) Test Type: flow-through test
Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity)	:	NOEC: 3 mg/l Exposure time: 7 d Species: Ceriodaphnia dubia (water flea) Test Type: semi-static test

12.2 Persistence and degradability

Product:

Biodegradability	:	Result: Not readily biodegradable. Biodegradation: 7,3 - 29 % Exposure time: 28 d Method: OECD Test Guideline 301F

Components:

benzene:

Biodegradability	:	Test Type: activated sludge Result: Readily biodegradable. Kinetic: 10 d: 88 % 28 d: 96 % Method: OECD Test Guideline 301F

12.3 Bioaccumulative potential

Product:

Bioaccumulation	:	Remarks: Bioaccumulation potential is evaluated based on the hydrocarbons present in the UVCB substance. Bioaccumulation not expected.

Components:

benzene:

Bioaccumulation	:	Bioconcentration factor (BCF): 13 Method: QSAR Remarks: Bioaccumulation not expected. log Pow: 2,13

12.4 Mobility in soil

Product:

Mobility	:	Medium: Water Remarks: practically insoluble
Distribution among environmental compartments	:	Adsorption/Soil log Koc: 2,44 - 4,55 Method: QSAR

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:

Additional ecological information	:	Avoid release to the environment. Refer to special instructions/ Safety data sheets.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product	:	Dispose of as hazardous waste in compliance with local and national regulations. Where possible recycling is preferred to disposal or incineration.

SECTION 14: Transport information

14.1 UN number or ID number

ADR	:	UN 3082
IMDG	:	UN 3082
IATA (Cargo)	:	UN 3082

14.2 UN proper shipping name

ADR	:	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (residues (petroleum), steam-cracked, naphthalene)
IMDG	:	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (residues (petroleum), steam-cracked, naphthalene)
IATA (Cargo)	:	Environmentally hazardous substance, liquid, n.o.s.

14.3 Transport hazard class(es)

ADR	:	9
IMDG	:	9
IATA (Cargo)	:	9

14.4 Packing group

ADR

Packing group	:	III
Classification Code	:	M6
Hazard Identification Number	:	90
Labels	:	9
Tunnel restriction code	:	(-)

IMDG

Packing group	:	III
Labels	:	9
EmS Code	:	F-A, S-F

IATA (Cargo)

Packing instruction (cargo aircraft)	:	964
Packing instruction (LQ)	:	Y964
Packing group	:	III
Labels	:	Miscellaneous

14.5 Environmental hazards

ADR

Environmentally hazardous	:	yes

IMDG

Marine pollutant	:	yes

IATA (Cargo)

Environmentally hazardous : yes

14.6 Special precautions for user

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

Remarks : Not applicable

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 3
toluene (Number on list 48)
benzene (Number on list 72, 5, 29, 28)
Residues (petroleum), steam-cracked; Heavy Fuel oil (Number on list 28)

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

Category		Quantity 1	Quantity 2
E2	ENVIRONMENTAL HAZARDS	200 t	500 t
34	Petroleum products: (a) gasolines and naphthas, (b) kerosenes (including jet fuels), (c) gas oils (including diesel fuels, home heating oils and gas oil blending streams),(d) heavy fuel oils (e) alternative fuels serving the same purposes and with similar properties as regards flammability and	2.500 t	25.000 t

environmental hazards as the products referred to in points (a) to (d)

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

2004/37/EC	:	Europe. Directive 2004/37/EC on the protection of workers from the risks related to exposure to carcinogens or mutagens at work
2006/15/EC	:	Europe. Indicative occupational exposure limit values
91/322/EEC	:	Europe. Commission Directive 91/322/EEC on establishing indicative limit values
2004/37/EC / TWA	:	Long term exposure limit
2006/15/EC / TWA	:	Limit Value - eight hours
2006/15/EC / STEL	:	Short term exposure limit
91/322/EEC / TWA	:	Limit Value - eight hours

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
Sources of key data used to compile the Safety Data Sheet	:	Chemical Safety Report, Fuel Oils. Lower Olefins and Aromatics REACH Consortium, 2023

Classification of the mixture:		**Classification procedure:**
Skin Irrit. 2	H315	Based on product data or assessment
Muta. 1B	H340	Calculation method
Carc. 1A	H350	Calculation method
Aquatic Chronic 2	H411	Calculation method

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	**Environment**	ERC1
Worker		
CS2	**General measures applicable to all activities, General measures (carcinogens), General measures (skin irritants)**	PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC9, PROC15, PROC28
CS3	**General exposures (closed systems)**	PROC1
CS4	**General exposures (closed systems), Outdoor**	PROC1
CS5	**General exposures (closed systems)**	PROC2
CS6	**General exposures (closed systems)**	PROC3
CS7	**Process sampling**	PROC9
CS8	**Laboratory activities**	PROC15
CS9	**Bulk transfers, Closed systems**	PROC8b
CS10	**Bulk transfers, Open systems**	PROC8b
CS11	**Equipment cleaning and maintenance**	PROC8a, PROC28
CS12	**Storage**	PROC1

1.2. Conditions of use affecting exposure

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

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

Annual amount per site	:	284000 t
Daily amount per site	:	950000 kg
Emission days	:	300
Conditions and measures related to sewage treatment plant		
STP type	:	Municipal sewage treatment plant
Other conditions affecting environmental exposure		
Local freshwater dilution factor	:	10
Local marine water dilution factor	:	100

1.2.2. Control of worker exposure: General measures applicable to all activities, General measures (carcinogens), General measures (skin irritants)
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 as laboratory reagent (PROC15) / Manual maintenance (cleaning and repair) of machinery (PROC28)

Product (article) characteristics		
Covers percentage substance in the product up to 100 %.		
Physical form of product	:	Liquid Pasty
Technical and organisational conditions and measures		
Occupational Health and Safety Management System: Advanced		
Conditions and measures related to personal protection, hygiene and health evaluation		
General measures (skin irritants) Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.		
General measures (carcinogens) Consider technical advances and process upgrades (including automation) for the elimination of releases.		

Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance.
Other conditions affecting workers exposure
Temperature : Assumes process temperature up to 20 °C

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)

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
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Conditions and measures related to personal protection, hygiene and health evaluation
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %
Other conditions affecting workers exposure
Indoor or outdoor use : Indoor use

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

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
Provide a basic standard of general ventilation (1 to 3 air changes per hour).

Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Outdoor use
Temperature	:	Assumes process temperature up to 200 °C

1.2.5. Control of worker exposure: General exposures (closed systems)
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	:	Covers daily exposures up to 8 hours
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use

1.2.6. Control of worker exposure: General exposures (closed systems)
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	:	Covers use up to
Use frequency	:	4 h/day

Technical and organisational conditions and measures
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).
Local exhaust ventilation Inhalation - minimum efficiency of 95 %
Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %
Other conditions affecting workers exposure
Indoor or outdoor use : Indoor use

1.2.7. Control of worker exposure: Process sampling
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 : Covers use up to
Use frequency : 0,25 h/day
Technical and organisational conditions and measures
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).
Local exhaust ventilation Inhalation - minimum efficiency of 95 %
Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %
Other conditions affecting workers exposure
Indoor or outdoor use : Indoor use

1.2.8. Control of worker exposure: Laboratory activities

Use as laboratory reagent (PROC15)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Covers use up to
Use frequency	:	4 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use

1.2.9. Control of worker exposure: Bulk transfers, Closed systems
Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Covers use up to
Use frequency	:	1 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of > 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		

Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use

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

Amount used, frequency and duration of use (or from service life)		
Duration	:	Covers use up to
Use frequency	:	1 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of > 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use

1.2.11. Control of worker exposure: Equipment cleaning and maintenance
Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a) / Manual maintenance (cleaning and repair) of machinery (PROC28)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Covers use up to
Use frequency	:	1 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Local exhaust ventilation Drain down and flush system prior to equipment break-in or maintenance.		

Inhalation - minimum efficiency of 95 %
Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %
Respiratory protection Efficiency: APF 10
Other conditions affecting workers exposure
Indoor or outdoor use : Indoor use

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

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
Provide a basic standard of general ventilation (1 to 3 air changes per hour).
Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %
Other conditions affecting workers exposure
Indoor or outdoor use : Outdoor use

1.3. Exposure estimation and reference to its source

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

Compartment	Exposure level	RCR
Freshwater	0,033 mg/L	0,72

Marine water	0,0033 mg/L	0,072
Freshwater sediment	0,55 mg/kg wet weight	0,91
Marine sediment	0,055 mg/kg wet weight	0,091
Agricultural soil	0,011 mg/kg wet weight	0,024

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	systemic	long-term		0,017	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		< 0,01	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

1.3.4. 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	systemic	long-term		0,017	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	

dermal	systemic	long-term		< 0,01	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

1.3.5. 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	systemic	long-term		0,336	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,179	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

1.3.6. 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	systemic	long-term		0,439	

inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		0,012	
dermal	systemic	long-term		0,054	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

1.3.7. 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	systemic	long-term		0,366	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,384	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative	systemic	long-term		0,439	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		0,019	
dermal	systemic	long-term		0,027	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative	systemic	long-term		0,183	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,768	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach

					used to conclude safe use.

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	systemic	long-term		0,183	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,768	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

1.3.11. Worker exposure: Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a) / Manual maintenance (cleaning and repair) of machinery (PROC28)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative	systemic	long-term		0,073	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,768	
dermal	local	long-term			Qualitative

					approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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	systemic	long-term		0,017	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		< 0,01	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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

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.

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	**Formulation & (re)packing of substances and mixtures, Environment**	ERC2
Worker		
CS2	**General measures applicable to all activities, General measures (carcinogens), General measures (skin irritants)**	PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC9, PROC14, PROC15, PROC28
CS3	**General exposures (closed systems)**	PROC1
CS4	**General exposures (closed systems), Outdoor**	PROC1
CS5	**General exposures (closed systems), With sample collection**	PROC2
CS6	**General exposures (closed systems)**	PROC3
CS7	**Batch processes at elevated temperatures, Use in contained batch processes**	PROC3
CS8	**Batch processes at elevated temperatures, Use in contained batch processes, Respiratory protection**	PROC3
CS9	**Process sampling**	PROC9
CS10	**Laboratory activities**	PROC15
CS11	**Bulk transfers, Dedicated facility**	PROC8b
CS12	**Bulk transfers, Dedicated facility, Respiratory protection**	PROC8b
CS13	**Drum/batch transfers, Dedicated facility**	PROC8b
CS14	**Drum/batch transfers, Dedicated facility, Respiratory protection**	PROC8b
CS15	**Production or preparation or articles by tabletting, compression, extrusion or pelletisation**	PROC14

CS16	**Drum and small package filling**	PROC9
CS17	**Drum and small package filling, Respiratory protection**	PROC9
CS18	**Equipment cleaning and maintenance**	PROC8a, PROC28
CS19	**Storage**	PROC1
CS20	**Storage**	PROC2

2.2. Conditions of use affecting exposure

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

Amount used, frequency and duration of use (or from service life)		
Annual amount per site	:	30000 t
Daily amount per site	:	100000 kg
Emission days	:	300
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

2.2.2. Control of worker exposure: General measures applicable to all activities, General measures (carcinogens), General measures (skin irritants)
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) / Tabletting, compression, extrusion, pelettisation, granulation (PROC14) / Use as laboratory reagent (PROC15) / Manual maintenance (cleaning and repair) of machinery (PROC28)

Product (article) characteristics		
Covers percentage substance in the product up to 100 %.		
Physical form of product	:	Liquid Pasty
Amount used, frequency and duration of use (or from service life)		
Duration	:	Covers daily exposures up to 8 hours
Duration	:	unless stated differently
Technical and organisational conditions and measures		
Occupational Health and Safety Management System: Advanced		
Conditions and measures related to personal protection, hygiene and health evaluation		
General measures (skin irritants) Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.		
General measures (carcinogens) Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance.		
Other conditions affecting workers exposure		
Temperature	:	Assumes process temperature up to 20 °C

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
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %
Other conditions affecting workers exposure
Indoor or outdoor use : Indoor use

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

Technical and organisational conditions and measures
Provide a basic standard of general ventilation (1 to 3 air changes per hour).
Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %
Other conditions affecting workers exposure
Indoor or outdoor use : Outdoor use

2.2.5. 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)

Technical and organisational conditions and measures
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).
Local exhaust ventilation Inhalation - minimum efficiency of 95 %
Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %

Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use

2.2.6. Control of worker exposure: General exposures (closed systems)
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	:	Covers use up to
Use frequency	:	8 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use

2.2.7. Control of worker exposure: Batch processes at elevated temperatures, Use in contained batch processes
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	:	Covers use up to
Use frequency	:	4 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		

Local exhaust ventilation Inhalation - minimum efficiency of 95 %
Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %
Other conditions affecting workers exposure
Indoor or outdoor use : Indoor use

2.2.8. Control of worker exposure: Batch processes at elevated temperatures, Use in contained batch processes, Respiratory protection
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 : Covers use up to
Use frequency : 4 h/day
Technical and organisational conditions and measures
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).
Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %
Respiratory protection Efficiency: APF 10
Other conditions affecting workers exposure
Indoor or outdoor use : Indoor use

2.2.9. Control of worker exposure: Process sampling
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	:	Covers use up to
Use frequency	:	0,25 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use

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

Amount used, frequency and duration of use (or from service life)		
Duration	:	Covers use up to
Use frequency	:	4 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Other conditions affecting workers exposure		

Indoor or outdoor use	:	Indoor use

2.2.11. 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	:	Covers use up to
Use frequency	:	1 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of > 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use
Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply		
Return IBCs or tanks to supplier for re-use.		

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

Amount used, frequency and duration of use (or from service life)		
Duration	:	Covers use up to
Use frequency	:	1 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		

Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %
Respiratory protection Efficiency: APF 10
Other conditions affecting workers exposure
Indoor or outdoor use : Indoor use

2.2.13. Control of worker exposure: Drum/batch 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 : Covers use up to
Use frequency : 1 h/day
Technical and organisational conditions and measures
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).
Local exhaust ventilation Inhalation - minimum efficiency of > 95 %
Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %
Other conditions affecting workers exposure
Indoor or outdoor use : Indoor use

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

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

Duration	:	Covers use up to
Use frequency	:	1 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Respiratory protection Efficiency: APF 10		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use

2.2.15. Control of worker exposure: Production or preparation or articles by tabletting, compression, extrusion or pelletisation
Tabletting, compression, extrusion, pelettisation, granulation (PROC14)

Product (article) characteristics		
Covers percentage substance in the product up to 5%.		
Technical and organisational conditions and measures		
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Respiratory protection Efficiency: APF 10		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use

2.2.16. Control of worker exposure: Drum and small package filling
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	:	Covers use up to
Use frequency	:	4 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Respiratory protection Efficiency: APF 10		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use

2.2.17. Control of worker exposure: Drum and small package filling, Respiratory protection
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	:	Covers use up to
Use frequency	:	4 h/day
Technical and organisational conditions and measures		
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of 95 %		

Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of > 90 %
Respiratory protection Efficiency: APF 10
Other conditions affecting workers exposure
Indoor or outdoor use : Indoor use

2.2.18. Control of worker exposure: Equipment cleaning and maintenance
Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a) / Manual maintenance (cleaning and repair) of machinery (PROC28)

Amount used, frequency and duration of use (or from service life)
Duration : Covers use up to
Use frequency : 4 h/day
Technical and organisational conditions and measures
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).
Local exhaust ventilation Drain down and flush system prior to equipment break-in or maintenance. Inhalation - minimum efficiency of 95 %
Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 90 %
Respiratory protection Efficiency: APF 10
Other conditions affecting workers exposure
Indoor or outdoor use : Indoor use

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

Technical and organisational conditions and measures
Provide a basic standard of general ventilation (1 to 3 air changes per hour).
Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %
Other conditions affecting workers exposure
Indoor or outdoor use : Outdoor use

2.2.20. Control of worker exposure: Storage
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 : Covers use up to
Use frequency : 4 h/day
Technical and organisational conditions and measures
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Local exhaust ventilation Inhalation - minimum efficiency of 95 %
Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %
Other conditions affecting workers exposure
Indoor or outdoor use : Indoor use

2.3. Exposure estimation and reference to its source

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

Compartment	Exposure level	RCR
Freshwater	0,033 mg/L	0,72
Marine water	0,0033 mg/L	0,072
Freshwater sediment	0,55 mg/kg wet weight	0,91
Marine sediment	0,055 mg/kg wet weight	0,091
Agricultural soil	0,0059 mg/kg wet weight	0,013

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	systemic	long-term		0,017	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		< 0,01	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

2.3.4. 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	systemic	long-term		0,017	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		< 0,01	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

2.3.5. 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	systemic	long-term		0,366	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,179	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

2.3.6. 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	systemic	long-term		0,439	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		0,012	
dermal	systemic	long-term		0,054	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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	systemic	long-term		0,439	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		0,012	
dermal	systemic	long-term		0,054	
dermal	local	long-term			Qualitative approach used to

					conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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	systemic	long-term		0,439	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		0,012	
dermal	systemic	long-term		0,054	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.
inhalative	systemic	long-term		0,366	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,179	
dermal	local	long-term			Qualitative approach

					used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

2.3.9. 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	systemic	long-term		0,366	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,384	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative	systemic	long-term		0,439	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.

inhalative	local	long-term		0,019	
dermal	systemic	long-term		0,027	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative	systemic	long-term		0,183	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,768	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative	systemic	long-term		0,366	

inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,768	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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	systemic	long-term		0,183	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,768	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative	systemic	long-term		0,366	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,768	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

2.3.15. Worker exposure: Tabletting, compression, extrusion, pelettisation, granulation (PROC14)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative	systemic	long-term		0,142	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,075	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach

					used to conclude safe use.

2.3.16. 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	systemic	long-term		0,22	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,537	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

2.3.17. 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	systemic	long-term		0,513	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,268	
dermal	local	long-term			Qualitative

					approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

2.3.18. Worker exposure: Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a) / Manual maintenance (cleaning and repair) of machinery (PROC28)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative	systemic	long-term		0,22	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,536	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

2.3.19. 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	systemic	long-term		0,017	
inhalative	systemic	short-term			Qualitative approach used to

					conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		< 0,01	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

2.3.20. 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	systemic	long-term		0,513	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,107	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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

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.

ES3: Use as an intermediate

3.1. Title section

Structured Short Title	:	Use as an intermediate, Use as an intermediate

Environment		
CS1	**Environment**	ERC6a
Worker		
CS2	**General measures applicable to all activities, General measures (carcinogens), General measures (skin irritants)**	PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC9, PROC15, PROC28
CS3	**Use as an intermediate, General exposures (closed systems)**	PROC1
CS4	**General exposures (closed systems), Outdoor**	PROC1
CS5	**General exposures (closed systems)**	PROC2
CS6	**General exposures (closed systems)**	PROC3
CS7	**Process sampling**	PROC9
CS8	**Process sampling, Respiratory protection**	PROC9
CS9	**Process sampling, Outdoor**	PROC9
CS10	**Laboratory activities**	PROC15
CS11	**Bulk transfers, Closed systems**	PROC8b
CS12	**Bulk transfers, Open systems**	PROC8b
CS13	**Bulk transfers, Open systems, Respiratory protection**	PROC8b
CS14	**Equipment cleaning and maintenance**	PROC8a, PROC28
CS15	**Storage**	PROC1
CS16	**Storage**	PROC2

3.2. Conditions of use affecting exposure

3.2.1. Control of environmental exposure: Use of intermediate (ERC6a)

Amount used, frequency and duration of use (or from service life)		
Annual amount per site	:	15000 t
Daily amount per site	:	50000 kg
Emission days	:	300
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

3.2.2. Control of worker exposure: General measures applicable to all activities, General measures (carcinogens), General measures (skin irritants)
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 as laboratory reagent (PROC15) / Manual maintenance (cleaning and repair) of machinery (PROC28)

Product (article) characteristics		
Covers percentage substance in the product up to 100 %.		
Physical form of product	:	Liquid Pasty
Amount used, frequency and duration of use (or from service life)		
Duration	:	Covers daily exposures up to 8 hours

Duration	:	unless stated differently
Technical and organisational conditions and measures		
Occupational Health and Safety Management System: Advanced		
Conditions and measures related to personal protection, hygiene and health evaluation		
General measures (skin irritants) Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.		
General measures (carcinogens) Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance.		
Other conditions affecting workers exposure		
Temperature	:	Assumes process temperature up to 20 °C

3.2.3. Control of worker exposure: Use as an intermediate, 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		
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).		
Conditions and measures related to personal protection, hygiene and health evaluation		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Use suitable eye protection.		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use

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

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		
Provide a basic standard of general ventilation (1 to 3 air changes per hour).		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Outdoor use
Temperature	:	Assumes process temperature up to 200 °C

3.2.5. Control of worker exposure: General exposures (closed systems)
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 a good standard of controlled ventilation (5 to 10 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use

3.2.6. Control of worker exposure: General exposures (closed systems)

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	:	Covers use up to
Use frequency	:	4 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use

3.2.7. Control of worker exposure: Process sampling
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	:	Covers use up to
Use frequency	:	0,25 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin.		

Dermal - minimum efficiency of 80 %		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use

3.2.8. Control of worker exposure: Process sampling, Respiratory protection
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	:	Covers use up to
Use frequency	:	0,25 h/day
Technical and organisational conditions and measures		
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Respiratory protection Efficiency: APF 20		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use

3.2.9. Control of worker exposure: Process sampling, Outdoor
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	:	Covers use up to
Use frequency	:	0,25 h/day
Technical and organisational conditions and measures		
Provide a basic standard of general ventilation (1 to 3 air changes per hour).		

Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %
Respiratory protection Efficiency: APF 20
Other conditions affecting workers exposure
Indoor or outdoor use : Outdoor use

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

Amount used, frequency and duration of use (or from service life)
Duration : Covers use up to
Use frequency : 4 h/day
Technical and organisational conditions and measures
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).
Local exhaust ventilation Inhalation - minimum efficiency of 95 %
Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %
Other conditions affecting workers exposure
Indoor or outdoor use : Indoor use

3.2.11. Control of worker exposure: Bulk transfers, Closed systems
Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Amount used, frequency and duration of use (or from service life)
Duration : Covers use up to

Use frequency	:	1 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of > 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use

3.2.12. Control of worker exposure: Bulk transfers, Open systems
Transfer of substance or mixture (charging/discharging) at dedicated facilities (PROC8b)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Covers use up to
Use frequency	:	1 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of > 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use

3.2.13. Control of worker exposure: Bulk transfers, Open systems, Respiratory protection

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

Amount used, frequency and duration of use (or from service life)		
Duration	:	Covers use up to
Use frequency	:	1 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use

3.2.14. Control of worker exposure: Equipment cleaning and maintenance
Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a) / Manual maintenance (cleaning and repair) of machinery (PROC28)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Covers use up to
Use frequency	:	1 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Local exhaust ventilation Drain down and flush system prior to equipment break-in or maintenance. Inhalation - minimum efficiency of 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Respiratory protection		

Efficiency: APF 10		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use

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

Technical and organisational conditions and measures		
Provide a basic standard of general ventilation (1 to 3 air changes per hour).		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Outdoor use

3.2.16. Control of worker exposure: Storage
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	:	Covers use up to
Use frequency	:	8 h/day
Technical and organisational conditions and measures		
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin.		

Dermal - minimum efficiency of 80 %		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use

3.3. Exposure estimation and reference to its source

3.3.1. Environmental release and exposure: Use of intermediate (ERC6a)

Compartment	Exposure level	RCR
Freshwater	0,033 mg/L	0,72
Marine water	0,0033 mg/L	0,072
Freshwater sediment	0,55 mg/kg wet weight	0,91
Marine sediment	0,055 mg/kg wet weight	0,091
Agricultural soil	0,0006 mg/kg wet weight	0,001

3.3.3. 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	systemic	long-term		0,017	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		< 0,01	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe

					use.

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	systemic	long-term		0,017	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		< 0,01	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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	systemic	long-term		0,366	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,179	
dermal	local	long-term			Qualitative approach used to

					conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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	systemic	long-term		0,439	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		0,012	
dermal	systemic	long-term		0,054	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

3.3.7. 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	systemic	long-term		0,366	
inhalative	systemic	short-term			Qualitative approach used to conclude safe

					use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,384	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

3.3.8. 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	systemic	long-term		0,427	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,384	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

3.3.9. 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	systemic	long-term		0,427	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,384	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative	systemic	long-term		0,439	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		0,019	
dermal	systemic	long-term		0,027	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative	systemic	long-term		0,183	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,768	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative	systemic	long-term		0,183	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,768	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative

					approach used to conclude safe use.

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

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative	systemic	long-term		0,366	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,768	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

3.3.14. Worker exposure: Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a) / Manual maintenance (cleaning and repair) of machinery (PROC28)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative	systemic	long-term		0,073	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,768	

dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

3.3.15. 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	systemic	long-term		0,017	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		< 0,01	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

3.3.16. 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	systemic	long-term		0,171	
inhalative	systemic	short-term			Qualitative approach

					used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,077	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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

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.

ES4: Use in fuel

4.1. Title section

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

Environment		
CS1	**Environment**	ERC7
Worker		
CS2	**General measures applicable to all activities, General measures (carcinogens), General measures (skin irritants)**	PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC16, PROC28
CS3	**Bulk transfers, Dedicated facility**	PROC8b
CS4	**Drum/batch transfers**	PROC8b
CS5	**General exposures (closed systems)**	PROC1
CS6	**General exposures (closed systems), Outdoor**	PROC1
CS7	**General exposures (closed systems), With occasional controlled exposure**	PROC2
CS8	**General exposures (closed systems), With occasional controlled exposure, Outdoor**	PROC2
CS9	**Use in fuel, Closed systems**	PROC16
CS10	**Use in fuel, Closed systems**	PROC3
CS11	**Equipment maintenance**	PROC8a, PROC28
CS12	**Storage**	PROC1
CS13	**Storage**	PROC2

4.2. Conditions of use affecting exposure

4.2.1. Control of environmental exposure: Use of functional fluid at industrial site (ERC7)

Amount used, frequency and duration of use (or from service life)		
Annual amount per site	:	80000 t
Daily amount per site	:	270000 kg
Emission days	:	300
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

4.2.2. Control of worker exposure: General measures applicable to all activities, General measures (carcinogens), General measures (skin irritants)
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) / Manual maintenance (cleaning and repair) of machinery (PROC28)

Product (article) characteristics		
Covers percentage substance in the product up to 100 %.		
Physical form of product	:	Liquid Pasty
Technical and organisational conditions and measures		
Occupational Health and Safety Management System: Advanced		
Conditions and measures related to personal protection, hygiene and health evaluation		
General measures (skin irritants) Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent /		

minimise exposures and to report any skin problems that may develop.
General measures (carcinogens) Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance.
Other conditions affecting workers exposure
Temperature : Assumes process temperature up to 20 °C

4.2.3. 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	:	Covers use up to
Use frequency	:	1 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of > 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use

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

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

Duration	:	Covers use up to
Use frequency	:	1 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of > 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use

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)

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		
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use

4.2.6. Control of worker exposure: General exposures (closed systems), Outdoor

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

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		
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Outdoor use

4.2.7. Control of worker exposure: General exposures (closed systems), With occasional controlled exposure
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	:	Covers daily exposures up to 8 hours
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Other conditions affecting workers exposure		

Indoor or outdoor use	:	Indoor use

4.2.8. Control of worker exposure: General exposures (closed systems), With occasional controlled exposure, Outdoor
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	:	Covers use up to
Use frequency	:	1 h/day
Technical and organisational conditions and measures		
Provide a basic standard of general ventilation (1 to 3 air changes per hour).		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Respiratory protection Efficiency: APF 10		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Outdoor use

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

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		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		

Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %
Other conditions affecting workers exposure
Indoor or outdoor use : Indoor use

4.2.10. Control of worker exposure: Use in fuel, Closed systems
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 : Covers use up to
Use frequency : 1 h/day
Technical and organisational conditions and measures
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).
Local exhaust ventilation Inhalation - minimum efficiency of 95 %
Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %
Other conditions affecting workers exposure
Indoor or outdoor use : Indoor use

4.2.11. Control of worker exposure: Equipment maintenance
Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a) / Manual maintenance (cleaning and repair) of machinery (PROC28)

Amount used, frequency and duration of use (or from service life)
Duration : Covers use up to
Use frequency : 1 h/day
Technical and organisational conditions and measures

Provide a good standard of controlled ventilation (5 to 10 air changes per hour).
Local exhaust ventilation Drain down and flush system prior to equipment break-in or maintenance. Inhalation - minimum efficiency of 95 %
Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of > 90 %
Respiratory protection Efficiency: APF 10
Other conditions affecting workers exposure
Indoor or outdoor use : Indoor use

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

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
Provide a basic standard of general ventilation (1 to 3 air changes per hour).
Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %
Other conditions affecting workers exposure
Indoor or outdoor use : Outdoor use

4.2.13. Control of worker exposure: Storage
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	:	Covers use up to
Use frequency	:	4 h/day
Technical and organisational conditions and measures		
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use

4.3. Exposure estimation and reference to its source

4.3.1. Environmental release and exposure: Use of functional fluid at industrial site (ERC7)

Compartment	Exposure level	RCR
Freshwater	0,0084 mg/L	0,18
Marine water	0,00084 mg/L	0,018
Freshwater sediment	0,14 mg/kg wet weight	0,23
Marine sediment	0,014 mg/kg wet weight	0,023
Agricultural soil	0,0016 mg/kg wet weight	0,003

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	systemic	long-term		0,183	

inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,768	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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	systemic	long-term		0,183	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,768	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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	systemic	long-term		0,017	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		< 0,01	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

4.3.6. 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	systemic	long-term		0,017	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		< 0,01	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative

					approach used to conclude safe use.

4.3.7. 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	systemic	long-term		0,366	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,179	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

4.3.8. 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	systemic	long-term		0,171	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,077	

dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

4.3.9. Worker exposure: Use of fuels (PROC16)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative	systemic	long-term		0,366	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,044	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

4.3.10. 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	systemic	long-term		0,146	
inhalative	systemic	short-term			Qualitative approach

					used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,039	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

4.3.11. Worker exposure: Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a) / Manual maintenance (cleaning and repair) of machinery (PROC28)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative	systemic	long-term		0,073	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,384	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

4.3.12. 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	systemic	long-term		0,017	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		< 0,01	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

4.3.13. 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	systemic	long-term		0,513	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,107	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to

					conclude safe use.

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

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.

ES5: Use in functional fluids, Industrial

5.1. Title section

Structured Short Title	:	Use at industrial sites, Use in functional fluids

Environment		
CS1	**Use in functional fluids, Environment**	ERC7
Worker		
CS2	**General measures applicable to all activities, General measures (carcinogens), General measures (skin irritants)**	PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC9
CS3	**Bulk transfers**	PROC1
CS4	**Bulk transfers, Closed systems**	PROC2
CS5	**Bulk transfers, Closed systems**	PROC3
CS6	**Bulk transfers, Closed systems**	PROC4
CS7	**Drum/batch transfers, Dedicated facility**	PROC8b
CS8	**Pelletizing, Closed systems**	PROC9
CS9	**Filling of equipment from drums or containers, Non-dedicated facility**	PROC8a
CS10	**General exposures (closed systems)**	PROC2
CS11	**General exposures (open systems)**	PROC4
CS12	**General exposures (open systems), Elevated temperature**	PROC4
CS13	**Remanufacture of reject articles**	PROC9
CS14	**Equipment maintenance**	PROC8a
CS15	**Storage**	PROC1
CS16	**Storage, Product sampling**	PROC2

5.2. Conditions of use affecting exposure

5.2.1. Control of environmental exposure: Use of functional fluid at industrial site (ERC7)

Amount used, frequency and duration of use (or from service life)		
Annual amount per site	:	10 t
Daily amount per site	:	500 kg
Emission days	:	20
Conditions and measures related to sewage treatment plant		
STP type	:	Municipal sewage treatment plant
Other conditions affecting environmental exposure		
Local freshwater dilution factor	:	10
Local marine water dilution factor	:	100

5.2.2. Control of worker exposure: General measures applicable to all activities, General measures (carcinogens), General measures (skin irritants)
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)

Product (article) characteristics		
Covers percentage substance in the product up to 100 %.		
Physical form of product	:	Liquid Pasty
Amount used, frequency and duration of use (or from service life)		
Duration	:	Covers daily exposures up to 8 hours
Duration	:	unless stated differently

Technical and organisational conditions and measures		
Occupational Health and Safety Management System: Advanced		
Conditions and measures related to personal protection, hygiene and health evaluation		
General measures (skin irritants) Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.		
General measures (carcinogens) Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance.		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use
Temperature	:	Assumes process temperature up to 20 °C

5.2.3. Control of worker exposure: Bulk transfers
Chemical production or refinery in closed process without likelihood of exposure or processes with equivalent containment conditions (PROC1)

Technical and organisational conditions and measures
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).
Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %

5.2.4. Control of worker exposure: Bulk transfers, Closed systems
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	:	Covers use up to
Use frequency	:	1 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of 95 %		

5.2.5. Control of worker exposure: Bulk transfers, Closed systems
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	:	Covers use up to
Use frequency	:	4 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		

5.2.6. Control of worker exposure: Bulk transfers, Closed systems
Chemical production where opportunity for exposure arises (PROC4)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Covers use up to
Use frequency	:	1 h/day
Technical and organisational conditions and measures		

Provide a good standard of controlled ventilation (5 to 10 air changes per hour).
Local exhaust ventilation Inhalation - minimum efficiency of 95 %
Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %

5.2.7. Control of worker exposure: Drum/batch 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	:	Covers use up to
Use frequency	:	1 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of > 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		

5.2.8. Control of worker exposure: Pelletizing, Closed systems
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	:	Covers use up to
Use frequency	:	1 h/day
Technical and organisational conditions and measures		
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).		

Local exhaust ventilation Inhalation - minimum efficiency of 95 %
Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %
Respiratory protection Efficiency: APF 10

5.2.9. Control of worker exposure: Filling of equipment from drums or 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	:	Covers use up to
Use frequency	:	1 h/day
Technical and organisational conditions and measures		
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Respiratory protection Efficiency: APF 10		

5.2.10. Control of worker exposure: General exposures (closed systems)
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	:	Covers use up to
Use frequency	:	8 h/day

Technical and organisational conditions and measures
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).
Local exhaust ventilation Inhalation - minimum efficiency of 95 %
Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %

5.2.11. Control of worker exposure: General exposures (open systems)
Chemical production where opportunity for exposure arises (PROC4)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Covers use up to
Use frequency	:	1 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		

5.2.12. Control of worker exposure: General exposures (open systems), Elevated temperature
Chemical production where opportunity for exposure arises (PROC4)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Covers use up to
Use frequency	:	1 h/day
Technical and organisational conditions and measures		

Provide a good standard of controlled ventilation (5 to 10 air changes per hour).
Local exhaust ventilation Inhalation - minimum efficiency of 95 %
Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %

5.2.13. Control of worker exposure: Remanufacture of reject articles
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	:	Covers use up to
Use frequency	:	4 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Respiratory protection Efficiency: APF 10		

5.2.14. Control of worker exposure: Equipment maintenance
Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Covers use up to
Use frequency	:	4 h/day

Technical and organisational conditions and measures
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).
Local exhaust ventilation Drain down and flush system prior to equipment break-in or maintenance. Inhalation - minimum efficiency of 95 %
Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 90 %
Respiratory protection Efficiency: APF 10

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

Technical and organisational conditions and measures
Provide a basic standard of general ventilation (1 to 3 air changes per hour).
Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %
Other conditions affecting workers exposure
Indoor or outdoor use : Outdoor use

5.2.16. Control of worker exposure: Storage, Product sampling
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 a good standard of controlled ventilation (5 to 10 air changes per hour).
Local exhaust ventilation Inhalation - minimum efficiency of 95 %

Conditions and measures related to personal protection, hygiene and health evaluation
Use suitable eye protection.
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %

5.3. Exposure estimation and reference to its source

5.3.1. Environmental release and exposure: Use of functional fluid at industrial site (ERC7)

Compartment	Exposure level	RCR
Freshwater	0,00047 mg/L	0,01
Marine water	0,000047 mg/L	0,001
Freshwater sediment	0,0079 mg/kg wet weight	0,013
Marine sediment	0,00079 mg/kg wet weight	0,001
Agricultural soil	0,0000071 mg/kg wet weight	0,000

5.3.3. 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	systemic	long-term		0,017	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		< 0,01	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach

					used to conclude safe use.

5.3.4. 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	systemic	long-term		0,073	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,384	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

5.3.5. 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	systemic	long-term		0,439	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		0,012	
dermal	systemic	long-term		0,054	

dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative	systemic	long-term		0,293	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,384	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative	systemic	long-term		0,183	
inhalative	systemic	short-term			Qualitative approach used to

					conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,768	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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	systemic	long-term		0,171	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,384	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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

Exposure route	Health effect	Exposure	Exposure level	RCR	Remarks

		indicator			
inhalative	systemic	long-term		0,171	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,768	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

5.3.10. 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	systemic	long-term		0,293	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,179	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe

					use.

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

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative	systemic	long-term		0,293	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,384	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative	systemic	long-term		0,293	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,384	
dermal	local	long-term			Qualitative approach used to conclude safe use.

dermal	local	short-term			Qualitative approach used to conclude safe use.

5.3.13. 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	systemic	long-term		0,22	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,537	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

5.3.14. 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	systemic	long-term		0,22	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,536	

dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

5.3.15. 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	systemic	long-term		0,017	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		< 0,01	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

5.3.16. 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	systemic	long-term		0,366	
inhalative	systemic	short-term			Qualitative approach

					used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,179	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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

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.

ES6: Use in fuel

6.1. Title section

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

Environment		
CS1	**Environment**	ERC9b, ERC9a
Worker		
CS2	**General measures applicable to all activities, General measures (skin irritants), General measures (carcinogens)**	PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC16, PROC28
CS3	**Bulk transfers, Dedicated facility**	PROC8b
CS4	**Drum/batch transfers, Dedicated facility**	PROC8b
CS5	**Refuelling**	PROC8b
CS6	**General exposures (closed systems)**	PROC1
CS7	**General exposures (closed systems), Outdoor**	PROC1
CS8	**General exposures (closed systems)**	PROC2
CS9	**General exposures (closed systems), Outdoor**	PROC2
CS10	**Use in fuel, Closed systems**	PROC16
CS11	**Use in fuel, Closed systems**	PROC3
CS12	**Equipment maintenance**	PROC8a, PROC28
CS13	**Storage**	PROC1
CS14	**Storage**	PROC2

6.2. Conditions of use affecting exposure

6.2.1. Control of environmental exposure: Widespread use of functional fluid (outdoor) (ERC9b) / Widespread use of functional fluid (indoor) (ERC9a)

Amount used, frequency and duration of use (or from service life)		
Annual amount per site	:	25 tonnes/year
Daily amount per site	:	68 kg/day
Emission days	:	365
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

6.2.2. Control of worker exposure: General measures applicable to all activities, General measures (skin irritants), General measures (carcinogens)
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) / Manual maintenance (cleaning and repair) of machinery (PROC28)

Product (article) characteristics		
Covers percentage substance in the product up to 5%.		
Physical form of product	:	Liquid Pasty
Technical and organisational conditions and measures		
Assumes a good basic standard of occupational hygiene is implemented		

Conditions and measures related to personal protection, hygiene and health evaluation		
General measures (skin irritants) Avoid direct skin contact with product. Identify potential areas for indirect skin contact. Wear gloves (tested to EN374) if hand contact with substance likely. Clean up contamination/spills as soon as they occur. Wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.		
General measures (carcinogens) Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when its use is identified for certain contributing scenarios; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance.		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Indoor use
Temperature	:	Assumes process temperature up to 20 °C

6.2.3. 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	:	Covers use up to
Use frequency	:	1 h/day
Technical and organisational conditions and measures		
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		

6.2.4. Control of worker exposure: Drum/batch 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	:	Covers use up to
Use frequency	:	1 h/day
Technical and organisational conditions and measures		
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).		
Local exhaust ventilation Use drum pumps. Inhalation - minimum efficiency of 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		

6.2.5. 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	:	Covers use up to
Use frequency	:	1 h/day
Technical and organisational conditions and measures		
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).		
Local exhaust ventilation Use drum pumps. Inhalation - minimum efficiency of 95 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		

6.2.6. 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)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Covers use up to
Use frequency	:	8 h/day
Technical and organisational conditions and measures		
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		

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

Amount used, frequency and duration of use (or from service life)		
Duration	:	Covers use up to
Use frequency	:	8 h/day
Technical and organisational conditions and measures		
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		

6.2.8. Control of worker exposure: General exposures (closed systems)
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	:	Covers use up to
Use frequency	:	1 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		

6.2.9. Control of worker exposure: General exposures (closed systems), Outdoor
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	:	Covers use up to
Use frequency	:	1 h/day
Technical and organisational conditions and measures		
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Respiratory protection Efficiency: APF 10		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Outdoor use

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

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

Duration	:	Covers use up to
Use frequency	:	4 h/day
Technical and organisational conditions and measures		
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Respiratory protection Efficiency: APF 10		

6.2.11. Control of worker exposure: Use in fuel, Closed systems
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	:	Covers use up to
Use frequency	:	4 h/day
Technical and organisational conditions and measures		
Provide a good standard of controlled ventilation (5 to 10 air changes per hour).		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Respiratory protection Efficiency: APF 10		

6.2.12. Control of worker exposure: Equipment maintenance
Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a) / Manual maintenance (cleaning and repair) of machinery (PROC28)

Amount used, frequency and duration of use (or from service life)		
Duration	:	Covers use up to

Use frequency	:	4 h/day
Technical and organisational conditions and measures		
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).		
Local exhaust ventilation Drain down and flush system prior to equipment break-in or maintenance. Inhalation - minimum efficiency of 90 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Respiratory protection Efficiency: APF 10		

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

Amount used, frequency and duration of use (or from service life)		
Duration	:	Covers use up to
Use frequency	:	8 h/day
Technical and organisational conditions and measures		
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		
Other conditions affecting workers exposure		
Indoor or outdoor use	:	Outdoor use

6.2.14. Control of worker exposure: Storage
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	:	Covers use up to
Use frequency	:	1 h/day
Technical and organisational conditions and measures		
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).		
Local exhaust ventilation Inhalation - minimum efficiency of 90 %		
Conditions and measures related to personal protection, hygiene and health evaluation		
Use suitable eye protection.		
Wear suitable gloves tested to EN374. Wear suitable coveralls to prevent exposure to the skin. Dermal - minimum efficiency of 80 %		

6.3. Exposure estimation and reference to its source

6.3.1. Environmental release and exposure: Widespread use of functional fluid (outdoor) (ERC9b) / Widespread use of functional fluid (indoor) (ERC9a)

Compartment	Exposure level	RCR
Freshwater	0,00002 mg/L	0,001
Marine water	0,0000002 mg/L	0,000
Freshwater sediment	0,0014 mg/kg wet weight	0,001
Marine sediment	0,000019 mg/kg wet weight	0,000
Agricultural soil	0,000012 mg/kg wet weight	0,000

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

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative	systemic	long-term		0,285	
inhalative	systemic	short-term			Qualitative approach used to

					conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,077	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative	systemic	long-term		0,285	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,077	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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

Exposure route	Health effect	Exposure	Exposure level	RCR	Remarks

		indicator			
inhalative	systemic	long-term		0,285	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,077	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

6.3.6. 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	systemic	long-term		> 0,01	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		< 0,01	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe

					use.

6.3.7. 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	systemic	long-term		< 0,01	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		< 0,01	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

6.3.8. 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	systemic	long-term		0,488	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		< 0,01	
dermal	local	long-term			Qualitative approach used to

					conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

6.3.9. 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	systemic	long-term		0,114	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		< 0,01	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

6.3.10. Worker exposure: Use of fuels (PROC16)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative	systemic	long-term		0,171	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	

dermal	systemic	long-term		< 0,01	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

6.3.11. 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	systemic	long-term		0,183	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		< 0,01	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

6.3.12. Worker exposure: Transfer of substance or mixture (charging/discharging) at non dedicated-facilities (PROC8a) / Manual maintenance (cleaning and repair) of machinery (PROC28)

Exposure route	Health effect	Exposure indicator	Exposure level	RCR	Remarks
inhalative	systemic	long-term		0,342	

inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		0,179	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

6.3.13. 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	systemic	long-term		< 0,01	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		< 0,01	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

6.3.14. 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	systemic	long-term		0,228	
inhalative	systemic	short-term			Qualitative approach used to conclude safe use.
inhalative	local	long-term		< 0,01	
dermal	systemic	long-term		< 0,01	
dermal	local	long-term			Qualitative approach used to conclude safe use.
dermal	local	short-term			Qualitative approach used to conclude safe use.

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

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.