

**SAFETY DATA SHEET**  
according to Regulation (EC) No. 1907/2006

**Crude C4**

Version 6.1

Revision Date 30.06.2011

Print Date 11.08.2011

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

**1.1 Product identifier**

Trade name : Crude C4

Registration number : 01-2119485494-27-0010, 01-2119485494-27-XXXX

Substance name : gases (petroleum, light steam-cracked, butadiene conc.)

Substance No. : 273-265-5

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

Use of the Substance/Mixture : Raw material in chemical industry

**1.3 Details of the supplier of the safety data sheet**

Manufacturer : Borealis Polymers Oy  
P.O.Box 330, FI-06101 Porvoo, Finland  
Telephone: +358 9 394900

Borealis AB  
S-444 86 Stenungsund, Sweden  
Telephone: +46 303 86000

Supplier : Borealis AG  
Wagramerstrasse 17-19, 1220 Vienna, Austria  
Telephone: +43 1 22400 0

E-mail address : [sds@borealisgroup.com](mailto:sds@borealisgroup.com)

**1.4 Emergency telephone number**

+358 9 39493416 Shift supervisor, Olefins (24h)  
+358 10 4582267 Fire department, Kilpilahti industrial area (24h)  
+358 9 471 977 Poison Information Centre, Finland (24h)

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**2. Hazards identification**

**2.1 Classification of the substance or mixture**

**Classification (REGULATION (EC) No 1272/2008)**

Flammable gases, Category 1	H220: Extremely flammable gas.
Gases under pressure, Refrigerated liquefied gas	H281: Contains refrigerated gas; may cause cryogenic burns or injury.
Germ cell mutagenicity, Category 1B	H340: May cause genetic defects.
Carcinogenicity, Category 1A	H350: May cause cancer.

**Classification (67/548/EEC, 1999/45/EC)**

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Extremely flammable  
Carcinogenic Category 1  
Mutagenic Category 2

R12: Extremely flammable.  
R45: May cause cancer.  
R46: May cause heritable genetic damage.

### 2.2 Label elements

#### Labelling (REGULATION (EC) No 1272/2008)

Hazard pictograms	:	  
Signal word	:	Danger
Hazard statements	:	H220 H281 H340 H350 Extremely flammable gas. Contains refrigerated gas; may cause cryogenic burns or injury. May cause genetic defects. May cause cancer.
Precautionary statements	:	<b>Prevention:</b> P202 P210 P243 P281 <b>Response:</b> P377 P381 P315 <b>Storage:</b> P410 + P403 Do not handle until all safety precautions have been read and understood. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Take precautionary measures against static discharge. Use personal protective equipment as required. Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so. Get immediate medical advice/ attention. Protect from sunlight. Store in a well-ventilated place.

Hazardous components which must be listed on the label:

- 68955-28-2 gases (petroleum, light steam-cracked, butadiene conc.)
- 106-99-0 1,3-butadiene

#### Additional Labelling:

Restricted to professional users.

### 2.3 Other hazards

The product evaporates readily.  
Rapid evaporation of the liquid may cause frostbite.  
Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing.  
Vapours may be irritating to eyes, nose, throat, and lungs.

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Exposure to the vapour may result in lowering of consciousness.  
Vapours may form explosive mixtures with air.  
High risk of fire in case of leakage.

### 3. Composition/information on ingredients

The product is a complex combination of hydrocarbons produced by the distillation of products from a thermal cracking process. It consists of hydrocarbons having a carbon number predominantly of C4.

#### 3.1 Substances

Chemical Name	CAS-No. EINECS-No. / ELINCS No.	Concentration [%]
Substance of unknown or variable composition, complex reaction products or biological material (UVCB) :		
gases (petroleum, light steam-cracked, butadiene conc.	68955-28-2 273-265-5	100
Contains :		
1,3-butadiene	106-99-0 203-450-8	> 30 - 50
butane	106-97-8 203-448-7	< 35
2-methylpropene	115-11-7 204-066-3	< 13
but-1-ene	106-98-9 203-449-2	< 15
butene, mixed-1-and-2-isomers	107-01-7 203-452-9	< 12
Impurities :		
isobutane	75-28-5 200-857-2	< 4

### 4. First aid measures

#### 4.1 Description of first aid measures

General advice	: 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. Avoid and prevent all contact and exposure. Move the victim to fresh air. In the case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
If inhaled	: Move to fresh air. Do not leave the victim unattended. Causes asphyxiation in high concentrations. The victim will not realize that he/she is suffocating. Keep patient warm and at rest.

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		Seek medical advice immediately. If breathing is irregular or stopped, administer artificial respiration. If unconscious place in recovery position.
In case of skin contact	:	Contact with liquid or refrigerated gas can cause cold burns and frostbite. Wash frost-bitten areas with plenty of water. Do not remove clothing. Seek medical advice.
In case of eye contact	:	Remove contact lenses. Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician. Keep eye wide open while rinsing.
If swallowed	:	Not probable: The product evaporates readily. Contact with liquid or refrigerated gas can cause cold burns and frostbite.

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

Symptoms	:	Shortness of breath Unconsciousness Frostbite
Risks	:	May cause effects on the central nervous system, resulting in lowering of consciousness.

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

Treatment	:	Artificial respiration and/or oxygen may be necessary. There is no specific antidote available. Treat frost-bitten areas as needed.
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## 5. Fire-fighting measures

### 5.1 Extinguishing media

Suitable extinguishing media	:	Dry powder Carbon dioxide (CO <sub>2</sub> ) Foam Water mist
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Unsuitable extinguishing media	:	Do NOT use water jet.
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### 5.2 Special hazards arising from the substance or mixture

Specific hazards during fire fighting	:	Vapours are heavier than air and may spread along floors. Flash back possible over considerable distance. Cool closed containers exposed to fire with water spray. Do not allow run-off from fire fighting to enter drains or water courses. Hazardous decomposition products formed under fire
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conditions.  
See chapter 10.

### 5.3 Advice for firefighters

- Special protective equipment for fire-fighters : Wear self-contained breathing apparatus and protective suit.
- Further information : Attempt to stop leakage without personal risk.  
If conditions permit, let fire burn itself out.  
Cool containers / tanks with water spray.

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## 6. Accidental release measures

### 6.1 Personal precautions, protective equipment and emergency procedures



- Personal precautions : Use personal protective equipment.  
Do not breathe vapours.  
Ensure adequate ventilation, especially in confined areas.  
Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.  
To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded.  
Avoid all contact with the product.  
Keep people away from and upwind of spill/leak.  
Attempt to stop leakage without personal risk.

### 6.2 Environmental precautions



- Environmental precautions : Prevent further leakage or spillage if safe to do so.  
Prevent product from entering environment and drains.  
If major spillage occurs, contact the proper local authorities.

### 6.3 Methods and materials for containment and cleaning up



- Methods for cleaning up : Attempt to stop leakage without personal risk.  
Ventilate the area.  
Allow to evaporate.

### 6.4 Reference to other sections

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

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## 7. Handling and storage

### 7.1 Precautions for safe handling



- Advice on safe handling : To be handled by trained personnel only.  
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 and flush system prior to equipment opening or maintenance.  
Clean / flush equipment, where possible, prior to

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	<p>maintenance. Consider the need for risk based health surveillance. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Wear respiratory protection when its use is identified for certain contributing scenarios. Smoking, eating and drinking should be prohibited in the application area. Ensure adequate ventilation, especially in confined areas. Prevent leaks by checking valves, pipelines and joints regularly. Handle and open container with care. Dispose of rinse water in accordance with local and national regulations. Vapours are heavier than air and may spread along floors. Keep away from incompatible materials.</p>
Advice on protection against fire and explosion	<p>: Vapours may form explosive mixtures with air. Take necessary action to avoid static electricity discharge (which might cause ignition of organic vapours). To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded. Ensure adequate ventilation. Keep product and empty container away from heat and sources of ignition.</p>

### 7.2 Conditions for safe storage, including any incompatibilities

Requirements for storage areas and containers	<p>: Keep only in the original container in a cool, well-ventilated place. Keep product and empty container away from heat and sources of ignition. No smoking. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Bund storage facilities to prevent soil and water pollution in the event of spillage. Store in accordance with the particular national regulations.</p>
Further information on storage conditions	<p>: Keep locked up or in an area accessible only to qualified or authorised persons. Ensure adequate ventilation.</p>
Advice on common storage	<p>: Keep away from incompatible materials. See chapter 10.</p>

German storage class : 2A Compressed, liquefied or pressurised gas

### 7.3 Specific end uses

Specific use(s) : Not applicable

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### 8. Exposure controls/personal protection

#### 8.1 Control parameters

Components	CAS-No.	Value	Control parameters	Update	Basis
1,3-butadiene	106-99-0	HTP-arvot 8h	1 ppm 2,2 mg/m <sup>3</sup>	2005-02-11	FI OEL
butane	106-97-8	HTP-arvot 8h	800 ppm 1.900 mg/m <sup>3</sup>	2007-08-09	FI OEL
		HTP-arvot 15 min	1.000 ppm 2.400 mg/m <sup>3</sup>	2007-08-09	FI OEL
isobutane	75-28-5	HTP-arvot 8h	800 ppm 1.900 mg/m <sup>3</sup>	2007-08-09	FI OEL
		HTP-arvot 15 min	1.000 ppm 2.400 mg/m <sup>3</sup>	2007-08-09	FI OEL

Limit values in other countries:

USA: 1,3-butadiene, 2 ppm (TWA/ACGIH 2009)

DNEL

1,3-butadiene

: End Use: Workers  
Exposure routes: Inhalation  
Potential health effects: Systemic  
Value: 2,21 mg/m<sup>3</sup>  
1 ppm  
Derived minimal effect level

#### 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

Respiratory protection : In case of insufficient ventilation: Self-contained breathing apparatus.  
Vapours are heavier than air and can cause suffocation by

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reducing oxygen available for breathing.

Hand protection : Cold-insulating gloves (e.g. nitrile rubber).  
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.  
The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it.  
This recommendation is only valid for the product mentioned in the safety data sheet and provided by us and for the application specified by us.

Eye protection : Safety goggles or face-shield.

Skin and body protection : Wear suitable protective clothing and rubber boots.

Protective measures : Avoid and prevent all spillage, contact and exposure.  
Consider the need for risk based health surveillance.

### Environmental exposure controls

General advice : Prevent further leakage or spillage if safe to do so.  
Prevent product from entering environment and drains.  
If major spillage occurs, contact the proper local authorities.

## 9. Physical and chemical properties

### 9.1 Information on basic physical and chemical properties

Appearance : Refrigerated liquefied gas

Colour : clear

Odour : characteristic

Melting range : -185 - -106 °C

Boiling point : < 0 °C

Flash point : -60 °C

Lower explosion limit : 1,6 %(V)  
ca. 1,1 %(V), 1,3-butadiene

Upper explosion limit : 12 %(V)  
16,3 %(V), 1,3-butadiene

Vapour pressure : not applicable

Relative vapour density : 2

Relative density : 0,6

Water solubility : 135,6 - 792,3 mg/l

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0,735 g/l, 20 °C, 1,3-butadiene

Partition coefficient: n-octanol/water	: log Pow: 2,09 - 2,31
Ignition temperature	: 364 - 413 °C
Explosive properties	: not applicable
Oxidizing properties	: not applicable

### 9.2 Other information

Molecular Weight	: not applicable
Surface tension	: not applicable

## 10. Stability and reactivity

### 10.1 Reactivity

Stable under recommended storage conditions. Vapours may form explosive mixture with air. Risk of violent reaction.
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### 10.2 Chemical stability

No decomposition if stored and applied as directed.
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### 10.3 Possibility of hazardous reactions

Hazardous reactions	: Polymerises with risk of fire and explosion.
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### 10.4 Conditions to avoid

Conditions to avoid	: Keep away from heat and sources of ignition.
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### 10.5 Incompatible materials

Materials to avoid	: Air Ozone Oxidizing agents Chlorine Hydrogen chloride Hydrogen fluoride chlorine dioxide nitrogen oxides Copper Copper alloys phenol crotonaldehyde hydroquinone
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### 10.6 Hazardous decomposition products

Hazardous decomposition products	: Under fire conditions: Carbon monoxide, carbon dioxide and unburned hydrocarbons (smoke).
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## 11. Toxicological information

### 11.1 Information on toxicological effects

#### Product

Acute oral toxicity	: study technically not feasible, (gaseous)
Acute inhalation toxicity	: LC50: > 5,3 mg/l, 4 h, rat(male and female), OECD Test Guideline 403
Acute dermal toxicity	: study technically not feasible, (gaseous)
Acute toxicity (other routes of administration)	: no data available
Skin corrosion/irritation	: study technically not feasible : rabbit, Result: No skin irritation
Serious eye damage/eye irritation	: study technically not feasible : rabbit, Result: No eye irritation
Respiratory or skin sensitization	: study technically not feasible
Germ cell mutagenicity	
Assessment	: May cause heritable genetic damage.

STOT - repeated exposure	: rat, Oral, 28 d, NOAEL: 148,6 mg/kg, OECD Test Guideline 407 : rat, Inhalation, NOAEL: 20 mg/l, OECD Test Guideline 422, No adverse effect has been observed in chronic toxicity tests.
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#### Components:

##### **1,3-butadiene :**

Acute inhalation toxicity	: LC50: 285 mg/l, 4 h, rat, : Effects: 8000 ppm, 8 h, human, No adverse effect has been observed in acute toxicity tests.
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## 12. Ecological information

### 12.1 Toxicity

#### Product:

Toxicity to fish	: LC50: 19 - 43 mg/l, QSAR
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Toxicity to daphnia and other aquatic invertebrates. : LC50: 11 - 16,3 mg/l, QSAR  
Toxicity to algae : EC50: 7,7 - 11 mg/l, QSAR

### Components:

#### **1,3-butadiene :**

Toxicity to fish : LC50: 43 - 45 mg/l, 96 h, Fish, QSAR, estimated  
Toxicity to daphnia and other aquatic invertebrates. : LC50: 24 - 33 mg/l, 48 h, Daphnia, QSAR, estimated  
Toxicity to algae : EC50: 33 mg/l, 72 h, algae, QSAR, estimated  
: EC50: 11 mg/l, 96 h, algae, QSAR, estimated

### **12.2 Persistence and degradability**

#### Product:

Biodegradability : 100 %, Test substance: n-Butane, 192h, 13 °C (0,00063 ml/l).

### **12.3 Bioaccumulative potential**

#### Product:

Bioaccumulation : Bioaccumulation not expected.

### **12.4 Mobility in soil**

#### Product:

Mobility : The product evaporates readily.

### **12.5 Results of PBT and vPvB assessment**

#### Product:

Assessment : This substance is not considered to be persistent, bioaccumulating nor toxic (PBT)., This substance is not considered to be very persistent nor very bioaccumulating (vPvB).

### **12.6 Other adverse effects**

#### Product:

Additional ecological information : The product should not be allowed to enter drains, water courses or the soil.

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## **13. Disposal considerations**

### **13.1 Waste treatment methods**

Product : Dispose of as hazardous waste in compliance with local and national regulations.  
European waste code:  
07 01 99 (wastes not otherwise specified (basic organic

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chemicals))  
Where possible recycling is preferred to disposal or  
incineration.

### 14. Transport information

#### 14.1 UN number

ADR : 1010  
IMDG : 1010

#### 14.2 Proper shipping name

ADR : BUTADIENES AND HYDROCARBON MIXTURE,  
STABILIZED  
IMDG : BUTADIENES AND HYDROCARBON MIXTURE,  
STABILIZED

#### 14.3 Transport hazard class

ADR : 2  
IMDG : 2.1

#### 14.4 Packing group

ADR :  
Hazard identification No : 239  
Labels : 2.1  
IMDG :  
EmS Number : F-D, S-U

#### 14.5 Environmental hazards

ADR :  
Environmentally hazardous : no

IMDG :  
Marine pollutant : no

#### 14.6 Special precautions for user

No specific instructions needed.

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

Ship type : NA  
Pollution category : NA

### 15. Regulatory information

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

Major Accident Hazard : 96/82/EC Update: 2003  
Legislation : Extremely flammable  
Category: 8

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Other regulations : Comply with below indicated regulations, relevant updates and amendments, as applicable:  
Europe. Directive 2004/37/EC on the protection of workers from the risks related to exposure to carcinogens or mutagens at work

### 15.2 Chemical Safety Assessment

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

## 16. Other information

### Full text of R-phrases referred to under sections 2 and 3

R12 Extremely flammable.  
R45 May cause cancer.  
R46 May cause heritable genetic damage.

### Full text of H-Statements referred to under sections 2 and 3.

H220 Extremely flammable gas.  
H281 Contains refrigerated gas; may cause cryogenic burns or injury.  
H340 May cause genetic defects.  
H350 May cause cancer.

### Further information

Other information : Changes since the last version are highlighted in the margin. This version replaces all previous versions.

Issuer : Borealis, Group Product Stewardship / Mikaela Eriksson & Andreas Ekholm

Sources of key data used to compile the Safety Data Sheet : Chemical Safety Report, C4, high 1,3-butadiene ( $\geq 0.1\%$ ). Lower Olefins and Aromatics REACH Consortium, 2010  
ECHA - Information on Registered Substances (<http://apps.echa.europa.eu/registered/registered-sub.aspx>)  
International Chemical Safety Card, 1,3-Butadiene, April 2000 (<http://www.inchem.org/documents/icsc/icsc/eics0017.htm>)  
IARC (International Agency for Research on Cancer) - Summaries & Evaluations, 1,3-Butadiene, 71 (1999) (<http://www.inchem.org/documents/iarc/vol71/002-butadiene.html>)  
Environment Guide 71; Environmental properties of chemicals, Finnish Environment Institute, Helsinki 2000

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### 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.

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### 1. Short title of Exposure Scenario: Manufacture

Main User Groups	: <b>SU 3:</b> Industrial uses: Uses of substances as such or in preparations at industrial sites
Sectors of end-use	: <b>SU 3, SU8, SU9:</b> Industrial uses: Uses of substances as such or in preparations at industrial sites, Manufacture of bulk, large scale chemicals (including petroleum products), Manufacture of fine chemicals
Process categories	: <b>PROC1:</b> Use in closed process, no likelihood of exposure <b>PROC2:</b> Use in closed, continuous process with occasional controlled exposure <b>PROC3:</b> Use in closed batch process (synthesis or formulation) <b>PROC4:</b> Use in batch and other process (synthesis) where opportunity for exposure arises <b>PROC8a:</b> Transfer of substance or preparation (charging/discharging) from/ to vessels/ large containers at non-dedicated facilities <b>PROC8b:</b> Transfer of substance or preparation (charging/discharging) from/ to vessels/ large containers at dedicated facilities <b>PROC15:</b> Use as laboratory reagent
Environmental Release Categories	: <b>ERC1, ERC4:</b> Manufacture of substances, Industrial use of processing aids in processes and products, not becoming part of articles

### 2.1 Contributing scenario controlling environmental exposure for: ERC1, ERC4: Manufacture of substances, Industrial use of processing aids in processes and products, not becoming part of articles

#### Amount used

Annual amount per site	: 50.000 t
Daily amount per site	: 170.000 kg
Daily amount per site (Msafe)	: 90.000.000 kg

#### Environment factors not influenced by risk management

Dilution Factor (River)	: 40
Dilution Factor (Coastal Areas)	: 100

#### Other given operational conditions affecting environmental exposure

Continuous use/release	
Number of emission days per year	: 300
Emission or Release Factor: Air	: 0 %
Emission or Release Factor: Water	: 0,001 %
Emission or Release Factor: Soil	: 0,01 %
Remarks	: Risk from environmental exposure is driven by humans via indirect exposure (primarily inhalation).

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### Technical conditions and measures / Organizational measures

- Air : Treat air emission to provide a typical removal efficiency of (%): (Effectiveness (of a measure): 90 %)
- Water : Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%): (Effectiveness (of a measure): 0 %)
- Remarks : Common practices vary across sites thus conservative process release estimates used., Prevent discharge of undissolved substance to or recover from onsite wastewater., Do not apply industrial sludge to natural soils., Sludge should be incinerated, contained or reclaimed.

### Conditions and measures related to municipal sewage treatment plant

- Type of Sewage Treatment Plant : Municipal sewage treatment plant
- Flow rate of sewage treatment plant effluent : 10.000 m<sup>3</sup>/d
- Effectiveness (of a measure) : 96,7 %
- Percentage removed from waste water : 96,7 %

### Conditions and measures related to external treatment of waste for disposal

- Remarks : During manufacturing no waste of the substance is generated.

### Conditions and measures related to external recovery of waste

- Remarks : During manufacturing no waste of the substance is generated.

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**2.2 Contributing scenario controlling worker exposure for: General measures (carcinogens), General risk management measures applicable to all activities PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC15: Use in closed process, no likelihood of exposure, Use in closed, continuous process with occasional controlled exposure, Use in closed batch process (synthesis or formulation), Use in batch and other process (synthesis) where opportunity for exposure arises, Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities, Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities, Use as laboratory reagent**

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### Product characteristics

- Remarks : Liquid, vapour pressure > 10 kPa

### Frequency and duration of use

- Remarks : Covers daily exposures up to 8 hours (unless stated differently).

### Other operational conditions affecting workers exposure

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

### Technical conditions and measures

Drain or remove substance from equipment prior to break-in or maintenance.

### Organisational measures to prevent /limit releases, dispersion and exposure

Consider technical advances and process upgrades (including automation) for the elimination of releases., Minimise exposure using measures such as closed systems, dedicated facilities and

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suitable general / local exhaust ventilation., 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 waste 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.

### Conditions and measures related to personal protection, hygiene and health evaluation

Wear suitable gloves tested to EN374.

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### 2.3 Contributing scenario controlling worker exposure for: General exposures (closed systems)

#### PROC1: Use in closed process, no likelihood of exposure

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#### Technical conditions and measures

Handle substance within a closed system., Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

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### 2.4 Contributing scenario controlling worker exposure for: General exposures (closed systems), with sample collection, With occasional controlled exposure.

#### PROC2: Use in closed, continuous process with occasional controlled exposure

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#### Technical conditions and measures

Handle substance within a predominantly closed system provided with extract ventilation., Sample via a closed loop or other system to avoid exposure., Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

#### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 1 hour.

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### 2.5 Contributing scenario controlling worker exposure for: General exposures (closed systems), Use in contained batch processes

#### PROC3: Use in closed batch process (synthesis or formulation)

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#### Technical conditions and measures

Handle substance within a predominantly closed system provided with extract ventilation., Sample via a closed loop or other system to avoid exposure., Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

#### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 15 minutes.

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### 2.6 Contributing scenario controlling worker exposure for: General exposures (open systems), Batch process, with sample collection PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises

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#### Technical conditions and measures

Handle substance within a predominantly closed system provided with extract ventilation., Sample via a closed loop or other system to avoid exposure., Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

#### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 15 minutes.

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### 2.7 Contributing scenario controlling worker exposure for: Process sampling PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

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#### Technical conditions and measures

Sample via a closed loop or other system to avoid exposure., Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

#### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 15 minutes., Ensure operatives are trained to minimise exposures.

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### 2.8 Contributing scenario controlling worker exposure for: Laboratory activities PROC15: Use as laboratory reagent

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#### Technical conditions and measures

Handle within a fume cupboard or implement equivalent measures to minimise exposures., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 90 %)

#### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 15 minutes.

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### 2.9 Contributing scenario controlling worker exposure for: Bulk transfers, (open systems), With potential for aerosol generation. PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

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### Technical conditions and measures

Use dry break couplings for material transfer., Ensure material transfers are under containment or extract ventilation., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 97 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 1 hour.

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## 2.10 Contributing scenario controlling worker exposure for: Bulk transfers, (closed systems)

### PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

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### Technical conditions and measures

Use dry break couplings for material transfer., Ensure material transfers are under containment or extract ventilation., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 97 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 1 hour.

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## 2.11 Contributing scenario controlling worker exposure for: Equipment cleaning and maintenance

### PROC8a: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities

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### Technical conditions and measures

Drain down and flush system prior to equipment opening or maintenance., Provide extraction ventilation at points where emissions occur., Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). (Effectiveness (of a measure): 90 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Clear spills immediately., Retain drain downs in sealed storage pending disposal or for subsequent recycle.

### Conditions and measures related to personal protection, hygiene and health evaluation

Wear a respirator conforming to EN140 with Type A filter or better.

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## 2.12 Contributing scenario controlling worker exposure for: Storage, With occasional controlled exposure.

### PROC2: Use in closed, continuous process with occasional controlled exposure

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### Technical conditions and measures

Sample via a closed loop or other system to avoid exposure., Provide extract ventilation to material transfer points and other openings., Store substance within a closed system., Avoid dip sampling., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour).  
(Effectiveness (of a measure): 90 %)

### 3. Exposure estimation and reference to its source

#### Environment

Contributing Scenario	Exposure Assessment Method	Specific conditions	Compartment	Value	Level of Exposure	RCR
ERC1, ERC4	Hydrocarbon Block method, PETRORISK		Fresh water			0,00032
			Marine water			0,00013
			Fresh water sediment			0,00037
			Marine sediment			0,00015

#### Workers

Contributing Scenario	Exposure Assessment Method	Specific conditions	Value	Level of Exposure	RCR
PROC1	ECETOC TRA		Inhalation	0,01 ppm	0,01
			Dermal	0,34 mg/kg/day	0,00
PROC2	ECETOC TRA		Inhalation	0,70 ppm	0,70
			Dermal	0,14 mg/kg/day	0,00
PROC3	ECETOC TRA		Inhalation	0,70 ppm	0,70
			Dermal	0,03 mg/kg/day	0,00
PROC4	ECETOC TRA		Inhalation	0,70 ppm	0,70
			Dermal	0,69 mg/kg/day	0,00
PROC8b	ECETOC TRA		Inhalation	0,53 ppm	0,53
			Dermal	0,69 mg/kg/day	0,00
PROC15	ECETOC TRA		Inhalation	0,50 ppm	0,50
			Dermal	0,03 mg/kg/day	0,00
PROC8b	ECETOC TRA		Inhalation	0,63 ppm	0,63
			Dermal	0,69 mg/kg/day	0,00
PROC8b	ECETOC TRA		Inhalation	0,63 ppm	0,63
			Dermal	0,69 mg/kg/day	0,00
PROC8a	ECETOC TRA		Inhalation	0,18 ppm	0,18
			Dermal	1,37 mg/kg/day	0,00
PROC2	ECETOC TRA		Inhalation	0,70 ppm	0,70
			Dermal	0,14 mg/kg/day	0,00

### 4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

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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. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>).

## 1. Short title of Exposure Scenario: Distribution

Main User Groups	: <b>SU 3:</b> Industrial uses: Uses of substances as such or in preparations at industrial sites
Sectors of end-use	: <b>SU 3, SU8, SU9:</b> Industrial uses: Uses of substances as such or in preparations at industrial sites, Manufacture of bulk, large scale chemicals (including petroleum products), Manufacture of fine chemicals
Process categories	: <b>PROC1:</b> Use in closed process, no likelihood of exposure <b>PROC2:</b> Use in closed, continuous process with occasional controlled exposure <b>PROC3:</b> Use in closed batch process (synthesis or formulation) <b>PROC4:</b> Use in batch and other process (synthesis) where opportunity for exposure arises <b>PROC8a:</b> Transfer of substance or preparation (charging/discharging) from/ to vessels/ large containers at non-dedicated facilities <b>PROC8b:</b> Transfer of substance or preparation (charging/discharging) from/ to vessels/ large containers at dedicated facilities <b>PROC9:</b> Transfer of substance or preparation into small containers (dedicated filling line, including weighing) <b>PROC15:</b> Use as laboratory reagent
Environmental Release Categories	: <b>ERC1, ERC2, ERC3, ERC4, ERC5, ERC6a, ERC6b, ERC6c, ERC6d, ERC7:</b> Manufacture of substances, Formulation of preparations, Formulation in materials, Industrial use of processing aids in processes and products, not becoming part of articles, Industrial use resulting in inclusion into or onto a matrix, Industrial use resulting in manufacture of another substance (use of intermediates), Industrial use of reactive processing aids, Industrial use of monomers for manufacture of thermoplastics, Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers, Industrial use of substances in closed systems

**2.1 Contributing scenario controlling environmental exposure for: ERC1, ERC2, ERC3, ERC4, ERC5, ERC6a, ERC6b, ERC6c, ERC6d, ERC7: Manufacture of substances, Formulation of preparations, Formulation in materials, Industrial use of processing aids in processes and products, not becoming part of articles, Industrial use resulting in inclusion into or onto a matrix, Industrial use resulting in manufacture of another substance (use of intermediates), Industrial use of reactive processing aids, Industrial use of monomers for manufacture of thermoplastics, Industrial use of process regulators for polymerisation processes in production of resins, rubbers, polymers, Industrial use of substances in closed systems**

### Amount used

Annual amount per site	: 100 t
Daily amount per site	: 5.000 kg

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Daily amount per site (Msafe) : 11.000.000 kg

### Environment factors not influenced by risk management

Dilution Factor (River) : 10  
Dilution Factor (Coastal Areas) : 100

### Other given operational conditions affecting environmental exposure

Continuous use/release  
Number of emission days per year : 20  
Emission or Release Factor: Air : 0,01 %  
Emission or Release Factor: Water : 0,001 %  
Emission or Release Factor: Soil : 0,001 %  
Remarks : Risk from environmental exposure is driven by humans via indirect exposure (primarily inhalation)., If discharging to domestic sewage treatment plant, no on-site wastewater treatment required.

### Technical conditions and measures / Organizational measures

Air : Treat air emission to provide a typical removal efficiency of (%): (Effectiveness (of a measure): 90 %)  
Water : Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%): (Effectiveness (of a measure): 0 %)  
Remarks : Common practices vary across sites thus conservative process release estimates used., Prevent discharge of undissolved substance to or recover from onsite wastewater., Do not apply industrial sludge to natural soils., Sludge should be incinerated, contained or reclaimed.

### Conditions and measures related to municipal sewage treatment plant

Type of Sewage Treatment Plant : Municipal sewage treatment plant  
Flow rate of sewage treatment plant effluent : 2.000 m<sup>3</sup>/d  
Effectiveness (of a measure) : 96,7 %  
Percentage removed from waste water : 96,7 %

### Conditions and measures related to external treatment of waste for disposal

Remarks : During manufacturing no waste of the substance is generated.

### Conditions and measures related to external recovery of waste

Remarks : During manufacturing no waste of the substance is generated.

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**2.2 Contributing scenario controlling worker exposure for: General measures (carcinogens), General risk management measures applicable to all activities PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC15: Use in closed process, no likelihood of exposure, Use in closed, continuous process with occasional controlled exposure, Use in closed batch process (synthesis or formulation), Use in batch and other process (synthesis) where opportunity for exposure arises, Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities, Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities, Use as laboratory reagent**

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### Product characteristics

Remarks : Liquid, vapour pressure > 10 kPa

### Frequency and duration of use

Remarks : Covers daily exposures up to 8 hours (unless stated differently).

### Other operational conditions affecting workers exposure

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

### Technical conditions and measures

Drain or remove substance from equipment prior to break-in or maintenance.

### Organisational measures to prevent /limit releases, dispersion and exposure

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., 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 waste 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.

### Conditions and measures related to personal protection, hygiene and health evaluation

Wear suitable gloves tested to EN374.

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## 2.3 Contributing scenario controlling worker exposure for: General exposures (closed systems)

### PROC1: Use in closed process, no likelihood of exposure

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### Technical conditions and measures

Handle substance within a closed system., Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

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## 2.4 Contributing scenario controlling worker exposure for: General exposures (closed systems), with sample collection, With occasional controlled exposure.

### PROC2: Use in closed, continuous process with occasional controlled exposure

---

### Technical conditions and measures

Handle substance within a predominantly closed system provided with extract ventilation., Sample via a closed loop or other system to avoid exposure., Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

### Organisational measures to prevent /limit releases, dispersion and exposure

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Avoid carrying out activities involving exposure for more than 1 hour.

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### **2.5 Contributing scenario controlling worker exposure for: General exposures (closed systems), Use in contained batch processes PROC3: Use in closed batch process (synthesis or formulation)**

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#### **Technical conditions and measures**

Handle substance within a predominantly closed system provided with extract ventilation., Sample via a closed loop or other system to avoid exposure., Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

#### **Organisational measures to prevent /limit releases, dispersion and exposure**

Avoid carrying out activities involving exposure for more than 15 minutes.

---

### **2.6 Contributing scenario controlling worker exposure for: General exposures (open systems), Batch process, with sample collection PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises**

---

#### **Technical conditions and measures**

Handle substance within a predominantly closed system provided with extract ventilation., Sample via a closed loop or other system to avoid exposure., Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

#### **Organisational measures to prevent /limit releases, dispersion and exposure**

Avoid carrying out activities involving exposure for more than 15 minutes.

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### **2.7 Contributing scenario controlling worker exposure for: Process sampling PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities**

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#### **Technical conditions and measures**

Sample via a closed loop or other system to avoid exposure., Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

#### **Organisational measures to prevent /limit releases, dispersion and exposure**

Avoid carrying out activities involving exposure for more than 15 minutes., Ensure operatives are trained to minimise exposures.

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### **2.8 Contributing scenario controlling worker exposure for: Laboratory activities PROC15: Use as laboratory reagent**

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### Technical conditions and measures

Handle within a fume cupboard or implement equivalent measures to minimise exposures., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 90 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 15 minutes.

---

## 2.9 Contributing scenario controlling worker exposure for: Bulk transfers, (closed systems)

### PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

---

### Technical conditions and measures

Use dry break couplings for material transfer., Ensure material transfers are under containment or extract ventilation., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 97 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 1 hour.

---

## 2.10 Contributing scenario controlling worker exposure for: Bulk transfers, (open systems)

### PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

---

### Technical conditions and measures

Use dry break couplings for material transfer., Ensure material transfers are under containment or extract ventilation., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 97 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 1 hour.

---

## 2.11 Contributing scenario controlling worker exposure for: Drum and small package filling

### PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

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### Technical conditions and measures

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Use dry break couplings for material transfer., Ensure material transfers are under containment or extract ventilation., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 97 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 1 hour.

## 2.12 Contributing scenario controlling worker exposure for: Equipment cleaning and maintenance

### PROC8a: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities

#### Technical conditions and measures

Drain down and flush system prior to equipment opening or maintenance., Provide extraction ventilation at points where emissions occur., Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). (Effectiveness (of a measure): 90 %)

#### Organisational measures to prevent /limit releases, dispersion and exposure

Clear spills immediately., Retain drain downs in sealed storage pending disposal or for subsequent recycle.

#### Conditions and measures related to personal protection, hygiene and health evaluation

Wear a respirator conforming to EN140 with Type A filter or better.

## 2.13 Contributing scenario controlling worker exposure for: Storage, With occasional controlled exposure.

### PROC2: Use in closed, continuous process with occasional controlled exposure

#### Technical conditions and measures

Sample via a closed loop or other system to avoid exposure., Provide extract ventilation to material transfer points and other openings., Store substance within a closed system., Avoid dip sampling., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 90 %)

## 3. Exposure estimation and reference to its source

### Environment

Contributing Scenario	Exposure Assessment Method	Specific conditions	Compartment	Value	Level of Exposure	RCR
ERC1-7	Hydrocarbon Block method, PETRORISK		Fresh water			0,00019
			Marine water			0,000019

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			Fresh water sediment			0,00022
			Marine sediment			0,000022

### Workers

Contributing Scenario	Exposure Assessment Method	Specific conditions	Value	Level of Exposure	RCR
PROC1	ECETOC TRA		Inhalation	0,01 ppm	0,01
			Dermal	0,34 mg/kg/day	0,00
PROC2	ECETOC TRA		Inhalation	0,70 ppm	0,70
			Dermal	0,14 mg/kg/day	0,00
PROC3	ECETOC TRA		Inhalation	0,70 ppm	0,70
			Dermal	0,03 mg/kg/day	0,00
PROC4	ECETOC TRA		Inhalation	0,70 ppm	0,70
			Dermal	0,69 mg/kg/day	0,00
PROC8b	ECETOC TRA		Inhalation	0,53 ppm	0,53
			Dermal	0,69 mg/kg/day	0,00
PROC15	ECETOC TRA		Inhalation	0,50 ppm	0,50
			Dermal	0,03 mg/kg/day	0,00
PROC8b	ECETOC TRA		Inhalation	0,63 ppm	0,63
			Dermal	0,69 mg/kg/day	0,00
PROC8b	ECETOC TRA		Inhalation	0,63 ppm	0,63
			Dermal	0,69 mg/kg/day	0,00
PROC9	ECETOC TRA		Inhalation	0,63 ppm	0,63
			Dermal	0,69 mg/kg/day	0,00
PROC8a	ECETOC TRA		Inhalation	0,18 ppm	0,18
			Dermal	1,37 mg/kg/day	0,00
PROC2	ECETOC TRA		Inhalation	0,70 ppm	0,70
			Dermal	0,14 mg/kg/day	0,00

#### 4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

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. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>).

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### 1. Short title of Exposure Scenario: Use as an intermediate

Main User Groups	: <b>SU 3:</b> Industrial uses: Uses of substances as such or in preparations at industrial sites
Sectors of end-use	: <b>SU 3, SU8, SU9:</b> Industrial uses: Uses of substances as such or in preparations at industrial sites, Manufacture of bulk, large scale chemicals (including petroleum products), Manufacture of fine chemicals
Process categories	: <b>PROC1:</b> Use in closed process, no likelihood of exposure <b>PROC2:</b> Use in closed, continuous process with occasional controlled exposure <b>PROC3:</b> Use in closed batch process (synthesis or formulation) <b>PROC4:</b> Use in batch and other process (synthesis) where opportunity for exposure arises <b>PROC8a:</b> Transfer of substance or preparation (charging/discharging) from/ to vessels/ large containers at non-dedicated facilities <b>PROC8b:</b> Transfer of substance or preparation (charging/discharging) from/ to vessels/ large containers at dedicated facilities <b>PROC15:</b> Use as laboratory reagent
Environmental Release Categories	: <b>ERC6a:</b> Industrial use resulting in manufacture of another substance (use of intermediates)

### 2.1 Contributing scenario controlling environmental exposure for: ERC6a: Industrial use resulting in manufacture of another substance (use of intermediates)

#### Amount used

Annual amount per site	: 15.000 t
Daily amount per site	: 50.000 kg
Daily amount per site (Msafe)	: 56.000 kg

#### Environment factors not influenced by risk management

Dilution Factor (River)	: 10
Dilution Factor (Coastal Areas)	: 100

#### Other given operational conditions affecting environmental exposure

Continuous use/release	
Number of emission days per year	: 300
Emission or Release Factor: Air	: 0,5 %
Emission or Release Factor: Water	: 0,03 %
Emission or Release Factor: Soil	: 0,1 %
Remarks	: Risk from environmental exposure is driven by freshwater sediment., If discharging to domestic sewage treatment plant, no on-site wastewater treatment required.

#### Technical conditions and measures / Organizational measures

Air	: Treat air emission to provide a typical removal efficiency of
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- Water : (%) (Effectiveness (of a measure): 80 %)  
: Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%) (Effectiveness (of a measure): 0 %)
- Remarks : Common practices vary across sites thus conservative process release estimates used., Prevent discharge of undissolved substance to or recover from onsite wastewater., Do not apply industrial sludge to natural soils., Sludge should be incinerated, contained or reclaimed.

### Conditions and measures related to municipal sewage treatment plant

- Type of Sewage Treatment Plant : Municipal sewage treatment plant  
Flow rate of sewage treatment plant effluent : 2.000 m<sup>3</sup>/d  
Effectiveness (of a measure) : 96,7 %  
Percentage removed from waste water : 96,7 %

### Conditions and measures related to external treatment of waste for disposal

- Remarks : This substance is consumed during use and no waste of the substance is generated.

### Conditions and measures related to external recovery of waste

- Remarks : This substance is consumed during use and no waste of the substance is generated.

---

**2.2 Contributing scenario controlling worker exposure for: General measures (carcinogens), General risk management measures applicable to all activities PROC1, PROC2, PROC3, PROC4, PROC8a, PROC8b, PROC15: Use in closed process, no likelihood of exposure, Use in closed, continuous process with occasional controlled exposure, Use in closed batch process (synthesis or formulation), Use in batch and other process (synthesis) where opportunity for exposure arises, Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities, Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities, Use as laboratory reagent**

---

### Product characteristics

- Remarks : Liquid, vapour pressure > 10 kPa

### Frequency and duration of use

- Remarks : Covers daily exposures up to 8 hours (unless stated differently).

### Other operational conditions affecting workers exposure

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

### Technical conditions and measures

Drain or remove substance from equipment prior to break-in or maintenance.

### Organisational measures to prevent /limit releases, dispersion and exposure

Consider technical advances and process upgrades (including automation) for the elimination of releases., Minimise exposure using measures such as closed systems, dedicated facilities and

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suitable general / local exhaust ventilation., 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 waste 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.

### Conditions and measures related to personal protection, hygiene and health evaluation

Wear suitable gloves tested to EN374.

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### 2.3 Contributing scenario controlling worker exposure for: General exposures (closed systems)

**PROC1: Use in closed process, no likelihood of exposure**

---

#### Technical conditions and measures

Handle substance within a closed system., Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

---

### 2.4 Contributing scenario controlling worker exposure for: General exposures (closed systems), with sample collection, With occasional controlled exposure.

**PROC2: Use in closed, continuous process with occasional controlled exposure**

---

#### Technical conditions and measures

Handle substance within a predominantly closed system provided with extract ventilation., Sample via a closed loop or other system to avoid exposure., Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

#### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 1 hour.

---

### 2.5 Contributing scenario controlling worker exposure for: General exposures (closed systems), Use in contained batch processes

**PROC3: Use in closed batch process (synthesis or formulation)**

---

#### Technical conditions and measures

Handle substance within a predominantly closed system provided with extract ventilation., Sample via a closed loop or other system to avoid exposure., Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

#### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 15 minutes.

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### 2.6 Contributing scenario controlling worker exposure for: General exposures (open systems), Batch process, with sample collection PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises

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#### Technical conditions and measures

Handle substance within a predominantly closed system provided with extract ventilation., Sample via a closed loop or other system to avoid exposure., Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

#### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 15 minutes.

---

### 2.7 Contributing scenario controlling worker exposure for: Process sampling PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

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#### Technical conditions and measures

Sample via a closed loop or other system to avoid exposure., Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

#### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 15 minutes., Ensure operatives are trained to minimise exposures.

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### 2.8 Contributing scenario controlling worker exposure for: Laboratory activities PROC15: Use as laboratory reagent

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#### Technical conditions and measures

Handle within a fume cupboard or implement equivalent measures to minimise exposures., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 90 %)

#### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 15 minutes.

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### 2.9 Contributing scenario controlling worker exposure for: Bulk transfers, (open systems), With potential for aerosol generation. PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

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### Technical conditions and measures

Use dry break couplings for material transfer., Ensure material transfers are under containment or extract ventilation., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 97 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 1 hour.

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## 2.10 Contributing scenario controlling worker exposure for: Bulk transfers, (closed systems)

### PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

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### Technical conditions and measures

Use dry break couplings for material transfer., Ensure material transfers are under containment or extract ventilation., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 97 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 1 hour.

---

## 2.11 Contributing scenario controlling worker exposure for: Equipment cleaning and maintenance

### PROC8a: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities

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### Technical conditions and measures

Drain down and flush system prior to equipment opening or maintenance., Provide extraction ventilation at points where emissions occur., Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). (Effectiveness (of a measure): 90 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Clear spills immediately., Retain drain downs in sealed storage pending disposal or for subsequent recycle.

### Conditions and measures related to personal protection, hygiene and health evaluation

Wear a respirator conforming to EN140 with Type A filter or better.

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## 2.12 Contributing scenario controlling worker exposure for: Storage, With occasional controlled exposure.

### PROC2: Use in closed, continuous process with occasional controlled exposure

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### Technical conditions and measures

Sample via a closed loop or other system to avoid exposure., Provide extract ventilation to material transfer points and other openings., Store substance within a closed system., Avoid dip sampling., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour).  
(Effectiveness (of a measure): 90 %)

### 3. Exposure estimation and reference to its source

#### Environment

Contributing Scenario	Exposure Assessment Method	Specific conditions	Compartment	Value	Level of Exposure	RCR
ERC6a	Hydrocarbon Block method, PETRORISK		Fresh water			0,057
			Marine water			0,0057
			Fresh water sediment			0,066
			Marine sediment			0,0066

#### Workers

Contributing Scenario	Exposure Assessment Method	Specific conditions	Value	Level of Exposure	RCR
PROC1	ECETOC TRA		Inhalation	0,01 ppm	0,01
			Dermal	0,34 mg/kg/day	0,00
PROC2	ECETOC TRA		Inhalation	0,70 ppm	0,70
			Dermal	0,14 mg/kg/day	0,00
PROC3	ECETOC TRA		Inhalation	0,70 ppm	0,70
			Dermal	0,03 mg/kg/day	0,00
PROC4	ECETOC TRA		Inhalation	0,70 ppm	0,70
			Dermal	0,69 mg/kg/day	0,00
PROC8b	ECETOC TRA		Inhalation	0,53 ppm	0,53
			Dermal	0,69 mg/kg/day	0,00
PROC15	ECETOC TRA		Inhalation	0,50 ppm	0,50
			Dermal	0,03 mg/kg/day	0,00
PROC8b	ECETOC TRA		Inhalation	0,63 ppm	0,63
			Dermal	0,69 mg/kg/day	0,00
PROC8b	ECETOC TRA		Inhalation	0,63 ppm	0,63
			Dermal	0,69 mg/kg/day	0,00
PROC8a	ECETOC TRA		Inhalation	0,18 ppm	0,18
			Dermal	1,37 mg/kg/day	0,00
PROC2	ECETOC TRA		Inhalation	0,70 ppm	0,70
			Dermal	0,14 mg/kg/day	0,00

### 4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

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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. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>).

## 1. Short title of Exposure Scenario: Formulation

Main User Groups	: <b>SU 3:</b> Industrial uses: Uses of substances as such or in preparations at industrial sites
Sectors of end-use	: <b>SU 3, SU 10:</b> Industrial uses: Uses of substances as such or in preparations at industrial sites, Formulation [mixing] of preparations and/ or re-packaging (excluding alloys)
Process categories	: <b>PROC1:</b> Use in closed process, no likelihood of exposure <b>PROC2:</b> Use in closed, continuous process with occasional controlled exposure <b>PROC3:</b> Use in closed batch process (synthesis or formulation) <b>PROC4:</b> Use in batch and other process (synthesis) where opportunity for exposure arises <b>PROC5:</b> Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) <b>PROC8a:</b> Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities <b>PROC8b:</b> Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities <b>PROC14:</b> Production of preparations or articles by tableting, compression, extrusion, pelletisation <b>PROC15:</b> Use as laboratory reagent
Environmental Release Categories	: <b>ERC2:</b> Formulation of preparations

### 2.1 Contributing scenario controlling environmental exposure for: ERC6a: Industrial use resulting in manufacture of another substance (use of intermediates)

#### Amount used

Annual amount per site	: 25.000 t
Daily amount per site	: 83.000 kg
Daily amount per site (Msafe)	: 2.700.000 kg

#### Environment factors not influenced by risk management

Dilution Factor (River)	: 10
Dilution Factor (Coastal Areas)	: 100

#### Other given operational conditions affecting environmental exposure

Continuous use/release	
Number of emission days per year	: 300
Emission or Release Factor: Air	: 0,01 %
Emission or Release Factor: Water	: 0,001 %
Emission or Release Factor: Soil	: 0,01 %
Remarks	: Risk from environmental exposure is driven by humans via indirect exposure (primarily inhalation)., If discharging to domestic sewage treatment plant, no on-site wastewater

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treatment required.

### Technical conditions and measures / Organizational measures

- Air : Treat air emission to provide a typical removal efficiency of (%): (Effectiveness (of a measure): 0 %)
- Water : Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%): (Effectiveness (of a measure): 0 %)
- Remarks : Common practices vary across sites thus conservative process release estimates used., Prevent discharge of undissolved substance to or recover from onsite wastewater., Do not apply industrial sludge to natural soils., Sludge should be incinerated, contained or reclaimed.

### Conditions and measures related to municipal sewage treatment plant

- Type of Sewage Treatment Plant : Municipal sewage treatment plant
- Flow rate of sewage treatment plant effluent : 2.000 m<sup>3</sup>/d
- Effectiveness (of a measure) : 96,7 %
- Percentage removed from waste water : 96,7 %

### Conditions and measures related to external treatment of waste for disposal

- Remarks : During manufacturing no waste of the substance is generated.

### Conditions and measures related to external recovery of waste

- Remarks : During manufacturing no waste of the substance is generated.

---

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

---

### Product characteristics

- Remarks : Liquid, vapour pressure > 10 kPa

### Frequency and duration of use

- Remarks : Covers daily exposures up to 8 hours (unless stated differently).

### Other operational conditions affecting workers exposure

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

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### Technical conditions and measures

Drain or remove substance from equipment prior to break-in or maintenance.

### Organisational measures to prevent /limit releases, dispersion and exposure

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., 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 waste 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.

### Conditions and measures related to personal protection, hygiene and health evaluation

Wear suitable gloves tested to EN374.

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## 2.3 Contributing scenario controlling worker exposure for: General exposures (closed systems)

### PROC1: Use in closed process, no likelihood of exposure

---

### Technical conditions and measures

Handle substance within a closed system.

---

## 2.4 Contributing scenario controlling worker exposure for: General exposures (closed systems), with sample collection, With occasional controlled exposure.

### PROC2: Use in closed, continuous process with occasional controlled exposure

---

### Technical conditions and measures

Handle substance within a predominantly closed system provided with extract ventilation., Provide extraction ventilation at points where emissions occur., Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour)., Sample via a closed loop or other system to avoid exposure. (Effectiveness (of a measure): 90 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 1 hour.

---

## 2.5 Contributing scenario controlling worker exposure for: General exposures (closed systems), Use in contained batch processes

### PROC3: Use in closed batch process (synthesis or formulation)

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### Technical conditions and measures

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Handle substance within a closed system., Provide extraction ventilation at points where emissions occur., Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour)., Sample via a closed loop or other system to avoid exposure. (Effectiveness (of a measure): 95 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 1 hour.

---

## 2.6 Contributing scenario controlling worker exposure for: General exposures (open systems), Batch process, with sample collection, With potential for aerosol generation.

**PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises**

---

### Technical conditions and measures

Formulate in enclosed or ventilated mixing vessels., Provide extraction ventilation at points where emissions occur., Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour)., Sample via a closed loop or other system to avoid exposure. (Effectiveness (of a measure): 95 %)

Transfer via enclosed lines., Clear transfer lines prior to de-coupling.

### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 1 hour.

---

## 2.7 Contributing scenario controlling worker exposure for: Batch processes at elevated temperatures

**PROC3: Use in closed batch process (synthesis or formulation)**

---

### Technical conditions and measures

Handle substance within a closed system., Provide extraction ventilation at points where emissions occur., Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour)., Sample via a closed loop or other system to avoid exposure. (Effectiveness (of a measure): 95 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 1 hour.

---

## 2.8 Contributing scenario controlling worker exposure for: Process sampling

**PROC3: Use in closed batch process (synthesis or formulation)**

---

### Technical conditions and measures

Handle substance within a closed system., Provide extraction ventilation at points where emissions occur., Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour)., Sample via a closed loop or other system to avoid exposure. (Effectiveness (of a measure): 95 %)

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### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 1 hour.

---

### 2.9 Contributing scenario controlling worker exposure for: Laboratory activities PROC15: Use as laboratory reagent

---

#### Technical conditions and measures

Handle within a fume cupboard or implement equivalent measures to minimise exposures., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 99 %)

---

### 2.10 Contributing scenario controlling worker exposure for: Bulk transfers PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

---

#### Technical conditions and measures

Clear transfer lines prior to de-coupling., Transfer via enclosed lines., Ensure material transfers are under containment or extract ventilation. (Effectiveness (of a measure): 97 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Clear spills immediately.

### Additional good practice advice beyond the REACH Chemical Safety Assessment

Additional good practice advice : Return IBCs or tanks to supplier for re-use.

---

### 2.11 Contributing scenario controlling worker exposure for: Mixing operations (open systems), With potential for aerosol generation. PROC5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact)

---

#### Technical conditions and measures

Provide extraction ventilation at points where emissions occur., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 90 %)

### Conditions and measures related to personal protection, hygiene and health evaluation

Wear a respirator conforming to EN140 with Type A filter or better.

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### 2.12 Contributing scenario controlling worker exposure for: Manual, Transfer from/pouring from containers PROC8a: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities

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### Technical conditions and measures

Use drum pumps or carefully pour from container., Provide extraction ventilation at points where emissions occur., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 90 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 4 hours., Avoid spillage when withdrawing pump.

### Conditions and measures related to personal protection, hygiene and health evaluation

Wear a respirator conforming to EN140 with Type A filter or better.

---

## 2.13 Contributing scenario controlling worker exposure for: Drum/batch transfers PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

---

### Technical conditions and measures

Use drum pumps or carefully pour from container., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour)., Ensure material transfers are under containment or extract ventilation. (Effectiveness (of a measure): 90 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid spillage when withdrawing pump.

### Conditions and measures related to personal protection, hygiene and health evaluation

Wear a respirator conforming to EN140 with Type A filter or better.

---

## 2.14 Contributing scenario controlling worker exposure for: Production or preparation or articles by tableting, compression, extrusion or pelletisation PROC14: Production of preparations or articles by tableting, compression, extrusion, pelletisation

---

### Technical conditions and measures

Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 90 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Limit the substance content in the product to 1 %.

### Conditions and measures related to personal protection, hygiene and health evaluation

Wear a respirator conforming to EN140 with Type A filter or better.

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### 2.15 Contributing scenario controlling worker exposure for: Drum and small package filling

#### PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

---

##### Technical conditions and measures

Clear transfer lines prior to de-coupling., Transfer via enclosed lines., Ensure material transfers are under containment or extract ventilation., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 95 %)

##### Organisational measures to prevent /limit releases, dispersion and exposure

Clear spills immediately., Put lids on containers immediately after use.

---

### 2.16 Contributing scenario controlling worker exposure for: Equipment cleaning and maintenance

#### PROC8a: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities

---

##### Technical conditions and measures

Drain down and flush system prior to equipment opening or maintenance., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour).

##### Organisational measures to prevent /limit releases, dispersion and exposure

Apply vessel entry procedures including use of forced supplied air., Clear spills immediately., Retain drain downs in sealed storage pending disposal or for subsequent recycle.

##### Conditions and measures related to personal protection, hygiene and health evaluation

Wear a respirator conforming to EN140 with Type A filter or better.

---

### 2.17 Contributing scenario controlling worker exposure for: Storage, With occasional controlled exposure.

#### PROC2: Use in closed, continuous process with occasional controlled exposure

---

##### Technical conditions and measures

Provide extract ventilation to material transfer points and other openings., Ensure material transfers are under containment or extract ventilation. (Effectiveness (of a measure): 90 %)  
Store substance within a closed system.

##### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 4 hours.

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## 3. Exposure estimation and reference to its source

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**Environment**

Contributing Scenario	Exposure Assessment Method	Specific conditions	Compartment	Value	Level of Exposure	RCR
ERC2	Hydrocarbon Block method, PETRORISK		Fresh water			0,0032
			Marine water			0,00032
			Fresh water sediment			0,0037
			Marine sediment			0,00037

**Workers**

Contributing Scenario	Exposure Assessment Method	Specific conditions	Value	Level of Exposure	RCR
PROC1	ECETOC TRA		Inhalation	0,01 ppm	0,01
			Dermal	0,34 mg/kg/day	0,00
PROC2	ECETOC TRA		Inhalation	0,70 ppm	0,70
			Dermal	0,14 mg/kg/day	0,00
PROC3	ECETOC TRA		Inhalation	0,70 ppm	0,70
			Dermal	0,03 mg/kg/day	0,00
PROC4	ECETOC TRA		Inhalation	0,70 ppm	0,70
			Dermal	0,69 mg/kg/day	0,00
PROC3	ECETOC TRA		Inhalation	0,70 ppm	0,70
			Dermal	0,03 mg/kg/day	0,00
PROC3	ECETOC TRA		Inhalation	0,70 ppm	0,70
			Dermal	0,03 mg/kg/day	0,00
PROC15	ECETOC TRA		Inhalation	0,15 ppm	0,15
			Dermal	0,03 mg/kg/day	0,00
PROC8b	ECETOC TRA		Inhalation	0,45 ppm	0,45
			Dermal	0,69 mg/kg/day	0,00
PROC5	ECETOC TRA		Inhalation	0,75 ppm	0,75
			Dermal	0,07 mg/kg/day	0,00
PROC8a	ECETOC TRA		Inhalation	0,90 ppm	0,90
			Dermal	0,14 mg/kg/day	0,00
PROC8b	ECETOC TRA		Inhalation	0,90 ppm	0,90
			Dermal	0,69 mg/kg/day	0,00
PROC14	ECETOC TRA		Inhalation	0,75 ppm	0,75
			Dermal	0,34 mg/kg/day	0,00
PROC9	ECETOC TRA		Inhalation	0,30 ppm	0,30
			Dermal	0,69 mg/kg/day	0,00
PROC8a	ECETOC TRA		Inhalation	0,75 ppm	0,75
			Dermal	1,37 mg/kg/day	0,00
PROC2	ECETOC TRA		Inhalation	0,90 ppm	0,90
			Dermal	1,37 mg/kg/day	0,00

**4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario**

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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. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>).

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### 1. Short title of Exposure Scenario: Use in coatings

Main User Groups	: <b>SU 3:</b> Industrial uses: Uses of substances as such or in preparations at industrial sites
Sectors of end-use	: <b>SU 3:</b> Industrial uses: Uses of substances as such or in preparations at industrial sites
Process categories	: <b>PROC1:</b> Use in closed process, no likelihood of exposure <b>PROC2:</b> Use in closed, continuous process with occasional controlled exposure <b>PROC3:</b> Use in closed batch process (synthesis or formulation) <b>PROC4:</b> Use in batch and other process (synthesis) where opportunity for exposure arises <b>PROC5:</b> Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) <b>PROC7:</b> Industrial spraying <b>PROC8a:</b> Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities <b>PROC8b:</b> Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities <b>PROC9:</b> Transfer of substance or preparation into small containers (dedicated filling line, including weighing) <b>PROC10:</b> Roller application or brushing <b>PROC13:</b> Treatment of articles by dipping and pouring <b>PROC14:</b> Production of preparations or articles by tableting, compression, extrusion, pelletisation <b>PROC15:</b> Use as laboratory reagent
Environmental Release Categories	: <b>ERC4:</b> Industrial use of processing aids in processes and products, not becoming part of articles

### 2.1 Contributing scenario controlling environmental exposure for: ERC4: Industrial use of processing aids in processes and products, not becoming part of articles

#### Amount used

Annual amount per site	: 100 t
Daily amount per site	: 5.000 kg
Daily amount per site (Msafe)	: 44.000 kg

#### Environment factors not influenced by risk management

Dilution Factor (River)	: 10
Dilution Factor (Coastal Areas)	: 100

#### Other given operational conditions affecting environmental exposure

Continuous use/release	
Number of emission days per year	: 20
Emission or Release Factor: Air	: 9,8 %

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Emission or Release Factor: Water : 0,07 %  
Emission or Release Factor: Soil : 0 %  
Remarks : Risk from environmental exposure is driven by humans via indirect exposure (primarily inhalation)., If discharging to domestic sewage treatment plant, no on-site wastewater treatment required.

### Technical conditions and measures / Organizational measures

Air : Treat air emission to provide a typical removal efficiency of (%): (Effectiveness (of a measure): 90 %)  
Water : Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%): (Effectiveness (of a measure): 0 %)  
Remarks : Common practices vary across sites thus conservative process release estimates used., Prevent discharge of undissolved substance to or recover from onsite wastewater., Do not apply industrial sludge to natural soils., Sludge should be incinerated, contained or reclaimed.

### Conditions and measures related to municipal sewage treatment plant

Type of Sewage Treatment Plant : Municipal sewage treatment plant  
Flow rate of sewage treatment plant effluent : 2.000 m3/d  
Effectiveness (of a measure) : 96,7 %  
Percentage removed from waste water : 96,7 %

### Conditions and measures related to external treatment of waste for disposal

Remarks : This substance is consumed during use and no waste of the substance is generated.

### Conditions and measures related to external recovery of waste

Remarks : This substance is consumed during use and no waste of the substance is generated.

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**2.2 Contributing scenario controlling worker exposure for: General measures (carcinogens), General risk management measures applicable to all activities PROC1, PROC2, PROC3, PROC4, PROC5, PROC7, PROC8a, PROC8b, PROC9, PROC10, PROC13, PROC14, PROC15: Use in closed process, no likelihood of exposure, Use in closed, continuous process with occasional controlled exposure, Use in closed batch process (synthesis or formulation), Use in batch and other process (synthesis) where opportunity for exposure arises, Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact), Industrial spraying, Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities, Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities, Transfer of substance or preparation into small containers (dedicated filling line, including weighing), Roller application or brushing, Treatment of articles by dipping and pouring, Production of preparations or articles by tableting, compression, extrusion, pelletisation, Use as laboratory reagent**

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### Product characteristics

Remarks : Liquid, vapour pressure > 10 kPa

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### Frequency and duration of use

Remarks : Covers daily exposures up to 8 hours (unless stated differently).

### Other operational conditions affecting workers exposure

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

### Technical conditions and measures

Drain or remove substance from equipment prior to break-in or maintenance.

### Organisational measures to prevent /limit releases, dispersion and exposure

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., 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 waste 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.

### Conditions and measures related to personal protection, hygiene and health evaluation

Wear suitable gloves tested to EN374.

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## 2.3 Contributing scenario controlling worker exposure for: General exposures (closed systems)

### PROC1: Use in closed process, no likelihood of exposure

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### Technical conditions and measures

Handle substance within a closed system.

---

## 2.4 Contributing scenario controlling worker exposure for: General exposures (closed systems), with sample collection, Use in contained systems

### PROC2: Use in closed, continuous process with occasional controlled exposure

---

### Technical conditions and measures

Handle substance within a closed system., Ensure material transfers are under containment or extract ventilation., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 90 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 4 hours.

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### 2.5 Contributing scenario controlling worker exposure for: Film formation - force drying (50 - 100°C). Stoving (>100°C). UV/EB radiation curing PROC2: Use in closed, continuous process with occasional controlled exposure

---

#### Technical conditions and measures

Ensure material transfers are under containment or extract ventilation., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 90 %)

#### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 4 hours.

---

### 2.6 Contributing scenario controlling worker exposure for: Mixing operations (closed systems), General exposures (closed systems) PROC3: Use in closed batch process (synthesis or formulation)

---

#### Technical conditions and measures

Formulate in enclosed or ventilated mixing vessels., Provide extraction ventilation at points where emissions occur., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 90 %)

#### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 1 hour.

#### Conditions and measures related to personal protection, hygiene and health evaluation

Wear a respirator conforming to EN140 with Type A filter or better.

---

### 2.7 Contributing scenario controlling worker exposure for: Film formation - air drying PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises

---

#### Technical conditions and measures

Provide extraction ventilation at points where emissions occur., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 90 %)

#### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 1 hour.

---

### 2.8 Contributing scenario controlling worker exposure for: Preparation of material for application, Mixing operations (open systems) PROC5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact)

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### Technical conditions and measures

Provide extraction ventilation at points where emissions occur., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 90 %)

### Conditions and measures related to personal protection, hygiene and health evaluation

Wear a respirator conforming to EN140 with Type A filter or better.

---

## 2.9 Contributing scenario controlling worker exposure for: Spraying (automatic/robotic)

### PROC7: Industrial spraying

---

### Technical conditions and measures

Carry out in a vented booth provided with laminar airflow. (Effectiveness (of a measure): 99 %)

### Conditions and measures related to personal protection, hygiene and health evaluation

Wear a respirator conforming to EN140 with Type A filter or better.

---

## 2.10 Contributing scenario controlling worker exposure for: Manual, Spraying

### PROC7: Industrial spraying

---

### Technical conditions and measures

Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour)., Minimise exposure by extracted full enclosure for the operation or equipment. (Effectiveness (of a measure): 90 %)

### Conditions and measures related to personal protection, hygiene and health evaluation

Wear a full face respirator conforming to EN140 with Type A filter or better., Wear suitable coveralls to prevent exposure to the skin.

---

## 2.11 Contributing scenario controlling worker exposure for: Material transfers, Non-dedicated facility

### PROC8a: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities

---

### Technical conditions and measures

Clear transfer lines prior to de-coupling., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour)., Ensure material transfers are under containment or extract ventilation. (Effectiveness (of a measure): 90 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 4 hours.

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### 2.12 Contributing scenario controlling worker exposure for: Material transfers, Dedicated facility PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

---

#### Technical conditions and measures

Clear transfer lines prior to de-coupling., Ensure material transfers are under containment or extract ventilation., Provide extraction ventilation at points where emissions occur. (Effectiveness (of a measure): 97 %)

#### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 1 hour.

---

### 2.13 Contributing scenario controlling worker exposure for: Roller, spreader, flow application PROC10: Roller application or brushing

---

#### Technical conditions and measures

Provide extraction ventilation at points where emissions occur., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 90 %)

#### Conditions and measures related to personal protection, hygiene and health evaluation

Wear a respirator conforming to EN140 with Type A filter or better.

---

### 2.14 Contributing scenario controlling worker exposure for: Dipping, immersion and pouring PROC13: Treatment of articles by dipping and pouring

---

#### Technical conditions and measures

Provide extraction ventilation at points where emissions occur., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 90 %)

#### Conditions and measures related to personal protection, hygiene and health evaluation

Wear a respirator conforming to EN140 with Type A filter or better.

---

### 2.15 Contributing scenario controlling worker exposure for: Laboratory activities PROC15: Use as laboratory reagent

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### Technical conditions and measures

Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour)., Handle within a fume cupboard or implement equivalent measures to minimise exposures. (Effectiveness (of a measure): 90 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 1 hour.

---

## 2.16 Contributing scenario controlling worker exposure for: Material transfers, Drum/batch transfers, Transfer from/pouring from containers PROC9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)

---

### Technical conditions and measures

Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour)., Ensure material transfers are under containment or extract ventilation. (Effectiveness (of a measure): 95 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 1 hour.

---

## 2.17 Contributing scenario controlling worker exposure for: Production or preparation or articles by tableting, compression, extrusion or pelletisation PROC14: Production of preparations or articles by tableting, compression, extrusion, pelletisation

---

### Technical conditions and measures

Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour)., Use ventilation to extract vapours from freshly coated articles/objects. (Effectiveness (of a measure): 90 %)

### Conditions and measures related to personal protection, hygiene and health evaluation

Wear a respirator conforming to EN140 with Type A filter or better.

---

## 2.18 Contributing scenario controlling worker exposure for: Equipment cleaning and maintenance PROC8a: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities

---

### Technical conditions and measures

Drain down system prior to equipment opening or maintenance., Provide extraction ventilation at points where emissions occur., Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). (Effectiveness (of a measure): 90 %)

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### Organisational measures to prevent /limit releases, dispersion and exposure

Clear spills immediately., Avoid carrying out activities involving exposure for more than 1 hour., Retain drain downs in sealed storage pending disposal or for subsequent recycle.

### 2.19 Contributing scenario controlling worker exposure for: Storage, With occasional controlled exposure.

#### PROC2: Use in closed, continuous process with occasional controlled exposure

### Technical conditions and measures

Handle substance within a closed system., Provide extraction ventilation at points where emissions occur., Store substance within a closed system. (Effectiveness (of a measure): 90 %)

## 3. Exposure estimation and reference to its source

### Environment

Contributing Scenario	Exposure Assessment Method	Specific conditions	Compartment	Value	Level of Exposure	RCR
ERC4	Hydrocarbon Block method, PETRORISK		Fresh water			0,013
			Marine water			0,0013
			Fresh water sediment			0,015
			Marine sediment			0,0015

### Workers

Contributing Scenario	Exposure Assessment Method	Specific conditions	Value	Level of Exposure	RCR
PROC1	ECETOC TRA		Inhalation	0,01 ppm	0,01
			Dermal	0,34 mg/kg/day	0,00
PROC2	ECETOC TRA		Inhalation	0,90 ppm	0,90
			Dermal	0,14 mg/kg/day	0,00
PROC2	ECETOC TRA		Inhalation	0,90 ppm	0,90
			Dermal	0,14 mg/kg/day	0,00
PROC3	ECETOC TRA		Inhalation	0,60 ppm	0,60
			Dermal	0,03 mg/kg/day	0,00
PROC4	ECETOC TRA		Inhalation	0,60 ppm	0,60
			Dermal	0,69 mg/kg/day	0,00
PROC5	ECETOC TRA		Inhalation	0,75 ppm	0,75
			Dermal	0,07 mg/kg/day	0,00
PROC7	ECETOC TRA		Inhalation	0,50 ppm	0,50
			Dermal	2,14 mg/kg/day	0,01
PROC7	ECETOC TRA		Inhalation	0,75 ppm	0,75
			Dermal	2,14 mg/kg/day	0,01

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PROC8a	ECETOC TRA		Inhalation	0,90 ppm	0,90
			Dermal	0,14 mg/kg/day	0,00
PROC8b	ECETOC TRA		Inhalation	0,90 ppm	0,90
			Dermal	0,69 mg/kg/day	0,00
PROC10	ECETOC TRA		Inhalation	0,75 ppm	0,75
			Dermal	1,37 mg/kg/day	0,00
PROC13	ECETOC TRA		Inhalation	0,75 ppm	0,75
			Dermal	0,69 mg/kg/day	0,00
PROC15	ECETOC TRA		Inhalation	0,70 ppm	0,70
			Dermal	0,03 mg/kg/day	0,00
PROC9	ECETOC TRA		Inhalation	0,60 ppm	0,60
			Dermal	0,69 mg/kg/day	0,00
PROC14	ECETOC TRA		Inhalation	0,75 ppm	0,75
			Dermal	0,34 mg/kg/day	0,00
PROC8a	ECETOC TRA		Inhalation	0,70 ppm	0,70
			Dermal	0,69 mg/kg/day	0,00
PROC2	ECETOC TRA		Inhalation	0,50 ppm	0,50
			Dermal	1,37 mg/kg/day	0,00

#### 4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

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. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>).

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### 1. Short title of Exposure Scenario: Use in fuels

Main User Groups	: <b>SU 3:</b> Industrial uses: Uses of substances as such or in preparations at industrial sites
Process categories	: <b>PROC1:</b> Use in closed process, no likelihood of exposure <b>PROC2:</b> Use in closed, continuous process with occasional controlled exposure <b>PROC3:</b> Use in closed batch process (synthesis or formulation) <b>PROC8a:</b> Transfer of substance or preparation (charging/discharging) from/ to vessels/ large containers at non-dedicated facilities <b>PROC8b:</b> Transfer of substance or preparation (charging/discharging) from/ to vessels/ large containers at dedicated facilities <b>PROC16:</b> Using material as fuel sources, limited exposure to unburned product to be expected
Environmental Release Categories	: <b>ERC7:</b> Industrial use of substances in closed systems

#### 2.1 Contributing scenario controlling environmental exposure for: ERC7: Industrial use of substances in closed systems

##### Amount used

Annual amount per site	: 10.000 t
Daily amount per site	: 33.000 kg
Daily amount per site (Msafe)	: 120.000 kg

##### Environment factors not influenced by risk management

Dilution Factor (River)	: 10
Dilution Factor (Coastal Areas)	: 100

##### Other given operational conditions affecting environmental exposure

Continuous use/release	
Number of emission days per year	: 300
Emission or Release Factor: Air	: 0,25 %
Emission or Release Factor: Water	: 0,001 %
Emission or Release Factor: Soil	: 0 %
Remarks	: Risk from environmental exposure is driven by humans via indirect exposure (primarily inhalation)., If discharging to domestic sewage treatment plant, no on-site wastewater treatment required.

##### Technical conditions and measures / Organizational measures

Air	: Treat air emission to provide a typical removal efficiency of (%): (Effectiveness (of a measure): 95 %)
Water	: Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%): (Effectiveness (of a measure): 0 %)
Remarks	: Common practices vary across sites thus conservative

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process release estimates used., Prevent discharge of undissolved substance to or recover from onsite wastewater., Do not apply industrial sludge to natural soils., Sludge should be incinerated, contained or reclaimed.

### Conditions and measures related to municipal sewage treatment plant

Type of Sewage Treatment Plant : Municipal sewage treatment plant  
Flow rate of sewage treatment : 2.000 m<sup>3</sup>/d  
plant effluent  
Effectiveness (of a measure) : 96,7 %  
Percentage removed from waste : 96,7 %  
water

### Conditions and measures related to external treatment of waste for disposal

Remarks : This substance is consumed during use and no waste of the substance is generated.

### Conditions and measures related to external recovery of waste

Remarks : This substance is consumed during use and no waste of the substance is generated.

---

**2.2 Contributing scenario controlling worker exposure for: General measures (carcinogens), General risk management measures applicable to all activities PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC16: Use in closed process, no likelihood of exposure, Use in closed, continuous process with occasional controlled exposure, Use in closed batch process (synthesis or formulation), Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities, Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities, Using material as fuel sources, limited exposure to unburned product to be expected**

---

### Product characteristics

Remarks : Liquid, vapour pressure > 10 kPa

### Frequency and duration of use

Remarks : Covers daily exposures up to 8 hours (unless stated differently).

### Other operational conditions affecting workers exposure

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

### Technical conditions and measures

Drain or remove substance from equipment prior to break-in or maintenance.

### Organisational measures to prevent /limit releases, dispersion and exposure

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., 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 waste safely., Ensure safe systems of work or equivalent arrangements are in place to manage risks., Regularly inspect, test

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and maintain all control measures., Consider the need for risk based health surveillance.

### Conditions and measures related to personal protection, hygiene and health evaluation

Wear suitable gloves tested to EN374.

---

### 2.3 Contributing scenario controlling worker exposure for: Bulk transfers PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises

---

#### Technical conditions and measures

Transfer via enclosed lines., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour)., Ensure material transfers are under containment or extract ventilation. (Effectiveness (of a measure): 90 %)  
Clear transfer lines prior to de-coupling.

---

### 2.4 Contributing scenario controlling worker exposure for: Drum/batch transfers PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

---

#### Technical conditions and measures

Use drum pumps., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour)., Ensure material transfers are under containment or extract ventilation. (Effectiveness (of a measure): 90 %)

---

### 2.5 Contributing scenario controlling worker exposure for: General exposures (closed systems) PROC1: Use in closed process, no likelihood of exposure

---

#### Technical conditions and measures

Handle substance within a closed system.

---

### 2.6 Contributing scenario controlling worker exposure for: General exposures (closed systems), With occasional controlled exposure. PROC2: Use in closed, continuous process with occasional controlled exposure

---

#### Technical conditions and measures

Handle substance within a closed system., Provide extraction ventilation at points where emissions occur., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 90 %)

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### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 4 hours.

---

### 2.7 Contributing scenario controlling worker exposure for: General exposures (closed systems), Batch process

#### PROC3: Use in closed batch process (synthesis or formulation)

---

#### Technical conditions and measures

Handle substance within a closed system., Provide extraction ventilation at points where emissions occur., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 90 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 1 hour.

---

### 2.8 Contributing scenario controlling worker exposure for: General exposures (open systems), (closed systems)

#### PROC16: Using material as fuel sources, limited exposure to unburned product to be expected

---

#### Technical conditions and measures

Handle substance within a predominantly closed system provided with extract ventilation., Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). (Effectiveness (of a measure): 90 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 1 hour.

---

### 2.9 Contributing scenario controlling worker exposure for: General exposures (open systems), (closed systems), Batch process

#### PROC3: Use in closed batch process (synthesis or formulation)

---

#### Technical conditions and measures

Handle substance within a predominantly closed system provided with extract ventilation., Provide extraction ventilation at points where emissions occur., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 90 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 1 hour.

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### 2.10 Contributing scenario controlling worker exposure for: Equipment maintenance

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### **PROC8a: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities**

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#### **Technical conditions and measures**

Drain down and flush system prior to equipment opening or maintenance., Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).

#### **Organisational measures to prevent /limit releases, dispersion and exposure**

Clear spills immediately., Retain drain downs in sealed storage pending disposal or for subsequent recycle.

#### **Conditions and measures related to personal protection, hygiene and health evaluation**

Wear a full face respirator conforming to EN140 with Type A filter or better.

---

### **2.11 Contributing scenario controlling worker exposure for: Storage PROC1: Use in closed process, no likelihood of exposure**

---

#### **Technical conditions and measures**

Handle substance within a closed system., Store substance within a closed system.

#### **Organisational measures to prevent /limit releases, dispersion and exposure**

No specific measures identified.

---

### **2.12 Contributing scenario controlling worker exposure for: Storage, With occasional controlled exposure. PROC2: Use in closed, continuous process with occasional controlled exposure**

---

#### **Technical conditions and measures**

Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour)., Provide extraction ventilation at points where emissions occur., Store substance within a closed system. (Effectiveness (of a measure): 90 %)

#### **Organisational measures to prevent /limit releases, dispersion and exposure**

Avoid carrying out activities involving exposure for more than 4 hours.

---

### **2.13 Contributing scenario controlling worker exposure for: Disposal of wastes PROC8a: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities**

---

#### **Technical conditions and measures**

Transfer via enclosed lines., Provide extraction ventilation at points where emissions occur., Provide

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a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 90 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Clear spills immediately.

### 3. Exposure estimation and reference to its source

#### Environment

Contributing Scenario	Exposure Assessment Method	Specific conditions	Compartment	Value	Level of Exposure	RCR
ERC7	Hydrocarbon Block method, PETRORISK		Fresh water			0,0013
			Marine water			0,00013
			Fresh water sediment			0,0015
			Marine sediment			0,00015

#### Workers

Contributing Scenario	Exposure Assessment Method	Specific conditions	Value	Level of Exposure	RCR
PROC4	ECETOC TRA		Inhalation	0,60 ppm	0,60
			Dermal	0,69 mg/kg/day	0,00
PROC8b	ECETOC TRA		Inhalation	0,90 ppm	0,90
			Dermal	0,69 mg/kg/day	0,00
PROC1	ECETOC TRA		Inhalation	0,01 ppm	0,01
			Dermal	0,03 mg/kg/day	0,00
PROC2	ECETOC TRA		Inhalation	0,90 ppm	0,90
			Dermal	1,37 mg/kg/day	0,00
PROC3	ECETOC TRA		Inhalation	0,60 ppm	0,60
			Dermal	0,34 mg/kg/day	0,00
PROC16	ECETOC TRA		Inhalation	0,35 ppm	0,35
			Dermal	0,34 mg/kg/day	0,00
PROC3	ECETOC TRA		Inhalation	0,60 ppm	0,60
			Dermal	0,34 mg/kg/day	0,00
PROC8a	ECETOC TRA		Inhalation	0,88 ppm	0,88
			Dermal	2,74 mg/kg/day	0,01
PROC1	ECETOC TRA		Inhalation	0,01 ppm	0,01
			Dermal	0,03 mg/kg/day	0,00
PROC2	ECETOC TRA		Inhalation	0,90 ppm	0,90
			Dermal	1,37 mg/kg/day	0,00
PROC8a	ECETOC TRA		Inhalation	0,70 ppm	0,70
			Dermal	1,37 mg/kg/day	0,00

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### **4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario**

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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. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>).

## 1. Short title of Exposure Scenario: Use in polymer production

Main User Groups	: <b>SU 3:</b> Industrial uses: Uses of substances as such or in preparations at industrial sites
Process categories	: <b>PROC1:</b> Use in closed process, no likelihood of exposure <b>PROC2:</b> Use in closed, continuous process with occasional controlled exposure <b>PROC3:</b> Use in closed batch process (synthesis or formulation) <b>PROC4:</b> Use in batch and other process (synthesis) where opportunity for exposure arises <b>PROC5:</b> Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact) <b>PROC6:</b> Calendering operations <b>PROC8a:</b> Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities <b>PROC8b:</b> Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities <b>PROC14:</b> Production of preparations or articles by tableting, compression, extrusion, pelletisation <b>PROC21:</b> Low energy manipulation of substances bound in materials and/ or articles
Environmental Release Categories	: <b>ERC4, ERC6c:</b> Industrial use of processing aids in processes and products, not becoming part of articles, Industrial use of monomers for manufacture of thermoplastics

### 2.1 Contributing scenario controlling environmental exposure for: ERC4, ERC6c: Industrial use of processing aids in processes and products, not becoming part of articles, Industrial use of monomers for manufacture of thermoplastics

#### Amount used

Annual amount per site	: 5.000 t
Daily amount per site	: 50.000 kg
Daily amount per site (Msafe)	: 400.000 kg

#### Environment factors not influenced by risk management

Dilution Factor (River)	: 10
Dilution Factor (Coastal Areas)	: 100

#### Other given operational conditions affecting environmental exposure

Continuous use/release	
Number of emission days per year	: 100
Emission or Release Factor: Air	: 0,2 %
Emission or Release Factor: Water	: 0,03 %
Emission or Release Factor: Soil	: 0,01 %

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Remarks : Risk from environmental exposure is driven by freshwater sediment., If discharging to domestic sewage treatment plant, no on-site wastewater treatment required.

### Technical conditions and measures / Organizational measures

Air : Treat air emission to provide a typical removal efficiency of (%): (Effectiveness (of a measure): 80 %)

Water : Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of (%): (Effectiveness (of a measure): 0 %)

Remarks : Common practices vary across sites thus conservative process release estimates used., Prevent discharge of undissolved substance to or recover from onsite wastewater., Do not apply industrial sludge to natural soils., Sludge should be incinerated, contained or reclaimed.

### Conditions and measures related to municipal sewage treatment plant

Type of Sewage Treatment Plant : Municipal sewage treatment plant

Flow rate of sewage treatment plant effluent : 2.000 m<sup>3</sup>/d

Effectiveness (of a measure) : 96,7 %

Percentage removed from waste water : 96,7 %

### Conditions and measures related to external treatment of waste for disposal

Remarks : This substance is consumed during use and no waste of the substance is generated.

### Conditions and measures related to external recovery of waste

Remarks : This substance is consumed during use and no waste of the substance is generated.

---

**2.2 Contributing scenario controlling worker exposure for: General measures (carcinogens), General risk management measures applicable to all activities PROC1, PROC2, PROC3, PROC4, PROC5, PROC6, PROC8a, PROC8b, PROC14, PROC21: Use in closed process, no likelihood of exposure, Use in closed, continuous process with occasional controlled exposure, Use in closed batch process (synthesis or formulation), Use in batch and other process (synthesis) where opportunity for exposure arises, Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact), Calendring operations, Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities, Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities, Production of preparations or articles by tableting, compression, extrusion, pelletisation, Low energy manipulation of substances bound in materials and/ or articles**

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### Product characteristics

Remarks : Liquid, vapour pressure > 10 kPa

### Frequency and duration of use

Remarks : Covers daily exposures up to 8 hours (unless stated differently).

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### Other operational conditions affecting workers exposure

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

### Technical conditions and measures

Drain or remove substance from equipment prior to break-in or maintenance.

### Organisational measures to prevent /limit releases, dispersion and exposure

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., 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 waste 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.

### Conditions and measures related to personal protection, hygiene and health evaluation

Wear suitable gloves tested to EN374.

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## 2.3 Contributing scenario controlling worker exposure for: General exposures (closed systems), Continuous process, no sampling

### PROC1: Use in closed process, no likelihood of exposure

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### Technical conditions and measures

Handle substance within a closed system.

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## 2.4 Contributing scenario controlling worker exposure for: Bulk transfers, transport, with sample collection

### PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities

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### Technical conditions and measures

Ensure material transfers are under containment or extract ventilation., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 97 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 4 hours.

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## 2.5 Contributing scenario controlling worker exposure for: Polymerisation (bulk and batch), Continuous process, with sample collection

### PROC2: Use in closed, continuous process with occasional controlled exposure

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### Technical conditions and measures

Ensure material transfers are under containment or extract ventilation., Ensure operation is undertaken outdoors. (Effectiveness (of a measure): 90 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Avoid carrying out activities involving exposure for more than 1 hour.

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## 2.6 Contributing scenario controlling worker exposure for: Polymerisation (bulk and batch), Batch process, with sample collection, elevated temperature PROC3: Use in closed batch process (synthesis or formulation)

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### Technical conditions and measures

Formulate in enclosed or ventilated mixing vessels., Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. (Effectiveness (of a measure): 95 %)

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## 2.7 Contributing scenario controlling worker exposure for: Finishing operations, Batch process, with sample collection PROC3: Use in closed batch process (synthesis or formulation)

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### Technical conditions and measures

Formulate in enclosed or ventilated mixing vessels., Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. (Effectiveness (of a measure): 95 %)

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## 2.8 Contributing scenario controlling worker exposure for: Intermediate polymer storage PROC4: Use in batch and other process (synthesis) where opportunity for exposure arises

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### Technical conditions and measures

Provide extraction ventilation at points where emissions occur., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 90 %)  
Store substance within a closed system.

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## 2.9 Contributing scenario controlling worker exposure for: Additivation and stabilisation PROC3: Use in closed batch process (synthesis or formulation)

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### Technical conditions and measures

Formulate in enclosed or ventilated mixing vessels., Provide extraction ventilation at points where emissions occur., Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings. (Effectiveness (of a measure): 95 %)

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### 2.10 Contributing scenario controlling worker exposure for: Mixing in containers, Batch process

#### PROC5: Mixing or blending in batch processes for formulation of preparations and articles (multistage and/ or significant contact)

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### Technical conditions and measures

Formulate in enclosed or ventilated mixing vessels., Provide extraction ventilation at points where emissions occur., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 90 %)

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### 2.11 Contributing scenario controlling worker exposure for: Pelletizing, Extrusion and masterbatching

#### PROC6: Calendering operations

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### Technical conditions and measures

Handle substance within a closed system., Provide extraction ventilation at points where emissions occur., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 90 %)

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### 2.12 Contributing scenario controlling worker exposure for: Pelletizing, Production or preparation or articles by tableting, compression, extrusion or pelletisation

#### PROC14: Production of preparations or articles by tableting, compression, extrusion, pelletisation

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### Technical conditions and measures

Provide extraction ventilation at points where emissions occur., Provide a good standard of general or controlled ventilation (10 to 15 air changes per hour). (Effectiveness (of a measure): 90 %)

### Organisational measures to prevent /limit releases, dispersion and exposure

Limit the substance content in the product to 1 %.

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### 2.13 Contributing scenario controlling worker exposure for: Pelletisation and pellet screening, (open systems)

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### **PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities**

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#### **Technical conditions and measures**

Ensure material transfers are under containment or extract ventilation. (Effectiveness (of a measure): 97 %)

#### **Organisational measures to prevent /limit releases, dispersion and exposure**

Limit the substance content in the product to 5 %.

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### **2.14 Contributing scenario controlling worker exposure for: Bulk transfers, Continuous process, with sample collection PROC3: Use in closed batch process (synthesis or formulation)**

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#### **Technical conditions and measures**

Formulate in enclosed or ventilated mixing vessels., Minimise exposure by partial enclosure of the operation or equipment and provide extract ventilation at openings., Ensure material transfers are under containment or extract ventilation. (Effectiveness (of a measure): 95 %)

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### **2.15 Contributing scenario controlling worker exposure for: transport, with sample collection PROC8b: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at dedicated facilities**

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#### **Technical conditions and measures**

Ensure material transfers are under containment or extract ventilation. (Effectiveness (of a measure): 97 %)

#### **Organisational measures to prevent /limit releases, dispersion and exposure**

Avoid carrying out activities involving exposure for more than 1 hour.

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### **2.16 Contributing scenario controlling worker exposure for: Equipment maintenance PROC8a: Transfer of substance or preparation (charging/ discharging) from/ to vessels/ large containers at non-dedicated facilities**

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#### **Technical conditions and measures**

Drain down system prior to equipment opening or maintenance., Provide extraction ventilation at points where emissions occur. (Effectiveness (of a measure): 90 %)

#### **Organisational measures to prevent /limit releases, dispersion and exposure**

Clear spills immediately., Avoid carrying out activities involving exposure for more than 1 hour.,

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Retain drain downs in sealed storage pending disposal or for subsequent recycle.

**2.17 Contributing scenario controlling worker exposure for: Storage, With occasional controlled exposure.**

**PROC2: Use in closed, continuous process with occasional controlled exposure**

**Technical conditions and measures**

Provide extraction ventilation at points where emissions occur., Store substance within a closed system. (Effectiveness (of a measure): 90 %)

**Organisational measures to prevent /limit releases, dispersion and exposure**

Avoid carrying out activities involving exposure for more than 1 hour.

**3. Exposure estimation and reference to its source**

**Environment**

Contributing Scenario	Exposure Assessment Method	Specific conditions	Compartment	Value	Level of Exposure	RCR
ERC4, ERC6c	Hydrocarbon Block method, PETRORISK		Fresh water			0,057
			Marine water			0,0057
			Fresh water sediment			0,066
			Marine sediment			0,0066

**Workers**

Contributing Scenario	Exposure Assessment Method	Specific conditions	Value	Level of Exposure	RCR
PROC1	ECETOC TRA		Inhalation	0,01 ppm	0,01
			Dermal	0,34 mg/kg/day	0,00
PROC8b	ECETOC TRA		Inhalation	0,81 ppm	0,81
			Dermal	0,69 mg/kg/day	0,00
PROC2	ECETOC TRA		Inhalation	0,70 ppm	0,70
			Dermal	0,14 mg/kg/day	0,00
PROC3	ECETOC TRA		Inhalation	0,50 ppm	0,50
			Dermal	0,34 mg/kg/day	0,00
PROC3	ECETOC TRA		Inhalation	0,50 ppm	0,50
			Dermal	0,03 mg/kg/day	0,00
PROC4	ECETOC TRA		Inhalation	0,30 ppm	0,30
			Dermal	0,69 mg/kg/day	0,00
PROC3	ECETOC TRA		Inhalation	0,50 ppm	0,50
			Dermal	0,03 mg/kg/day	0,00
PROC5	ECETOC TRA		Inhalation	0,75 ppm	0,75

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			Dermal	1,37 mg/kg/day	0,00
PROC6	ECETOC TRA		Inhalation	0,75 ppm	0,75
			Dermal	1,37 mg/kg/day	0,00
PROC14	ECETOC TRA		Inhalation	0,75 ppm	0,75
			Dermal	0,34 mg/kg/day	0,00
PROC8b	ECETOC TRA		Inhalation	0,90 ppm	0,90
			Dermal	0,69 mg/kg/day	0,00
PROC3	ECETOC TRA		Inhalation	0,50 ppm	0,50
			Dermal	0,34 mg/kg/day	0,00
PROC8b	ECETOC TRA		Inhalation	0,90 ppm	0,90
			Dermal	0,69 mg/kg/day	0,00
PROC8a	ECETOC TRA		Inhalation	0,50 ppm	0,50
			Dermal	1,37 mg/kg/day	0,00
PROC2	ECETOC TRA		Inhalation	0,70 ppm	0,70
			Dermal	1,37 mg/kg/day	0,00

#### 4. Guidance to Downstream User to evaluate whether he works inside the boundaries set by the Exposure Scenario

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. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Further details on scaling and control technologies are provided in SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>).