



# SAFETY DATA SHEET

DOW BENELUX B.V.

Safety Data Sheet according to Reg. (EU) 2020/878

**Product name:** DOWTHERM™ Q Heat Transfer Fluid

**Revision Date:** 09.01.2025

**Version:** 3.0

**Date of last issue:** 27.09.2022

**Print Date:** 10.01.2025

DOW BENELUX B.V. encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

## SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

### 1.1 Product identifier

**Product name:** DOWTHERM™ Q Heat Transfer Fluid

**Chemical name of the substance:** Benzene, ethylenated, by-products from

**CASRN:** 68608-82-2

**EC-No.:** 271-802-8

**REACH Registration Number:** 01-2119472547-29-0003

01-2119472547-29-0004

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

**Identified uses:** Manufacture: Manufacture of substance. Formulation or re-packing: Formulation & (re)packing of substances and mixtures. Use at industrial sites: Use in functional fluids. Use in fuel. Use in process chemicals.

For details on use descriptors and exposure scenarios, please refer to the extended part of the Safety Data Sheet.

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

#### COMPANY IDENTIFICATION

DOW BENELUX B.V.

HERBERT H.DOWWEG 5

HOEK

4542 NM TERNEUZEN

NETHERLANDS

**Customer Information Number:**

(31) 115 67 2626

SDSQuestion@dow.com

### 1.4 EMERGENCY TELEPHONE NUMBER

**24-Hour Emergency Contact:** 31-(0)115 694982

**Local Emergency Contact:** 00 31 115 69 4982

**The phone number of the national poisoning information center (NVIC). Only for the purpose of informing medical personnel in case of acute intoxications:** 088 755 8000

---

## SECTION 2: HAZARDS IDENTIFICATION

---

### 2.1 Classification of the substance or mixture

**Classification according to Regulation (EC) No 1272/2008:**

Skin irritation - Category 2 - H315

Skin sensitisation - Sub-category 1B - H317

Aspiration hazard - Category 1 - H304

Short-term (acute) aquatic hazard - Category 1 - H400

Long-term (chronic) aquatic hazard - Category 1 - H410

For the full text of the H-Statements mentioned in this Section, see Section 16.

### 2.2 Label elements

**Labelling according to Regulation (EC) No 1272/2008:****Hazard pictograms****Signal word: DANGER****Hazard statements**

H304 May be fatal if swallowed and enters airways.

H315 Causes skin irritation.

H317 May cause an allergic skin reaction.

H410 Very toxic to aquatic life with long lasting effects.

**Precautionary statements**

P261 Avoid breathing mist or vapours.

P273 Avoid release to the environment.

P280 Wear protective gloves.

P301 + P310 IF SWALLOWED: Immediately call a POISON CENTER/ doctor.

P331 Do NOT induce vomiting.

P391 Collect spillage.

### 2.3 Other hazards

This product contains no substances assessed to be PBT or vPvB at levels of 0.1% or higher.

**Endocrine disrupting properties**

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

Human Health: The substance/mixture does not contain components considered to have endocrine disrupting properties according to REACH Article 57(f) or Commission Delegated regulation (EU) 2017/2100 or Commission Regulation (EU) 2018/605

at levels of 0.1% or higher.

## SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

### 3.1 Substances

This product is a substance.

CASRN / EC-No. / Index-No.	REACH Registration Number	Concentration	Component	Classification: REGULATION (EC) No 1272/2008
<b>CASRN</b> 68608-82-2 <b>EC-No.</b> 271-802-8 <b>Index-No.</b> –	01-2119472547-29	> 99,0 %	Benzene, ethylenated, by- products from	Skin Irrit. 2; H315 Skin Sens. 1B; H317 Asp. Tox. 1; H304 Aquatic Acute 1; H400 Aquatic Chronic 1; H410  M-Factor (Acute aquatic toxicity): 1 M-Factor (Chronic aquatic toxicity): 1  Acute toxicity estimate Acute oral toxicity: > 5 000 mg/kg Acute inhalation toxicity: > 1,6 mg/l, 1 Hour, vapour

For the full text of the H-Statements mentioned in this Section, see Section 16.

## SECTION 4: FIRST AID MEASURES

### 4.1 Description of first aid measures

#### General advice:

First Aid responders should pay attention to self-protection and use the recommended protective clothing (chemical resistant gloves, splash protection). If potential for exposure exists refer to Section 8 for specific personal protective equipment.

**Inhalation:** Move person to fresh air and keep comfortable for breathing; consult a physician.

**Skin contact:** Remove material from skin immediately by washing with soap and plenty of water. Remove contaminated clothing and shoes while washing. Seek medical attention if irritation or rash occurs. Wash clothing before reuse. Discard items which cannot be decontaminated, including leather articles such as shoes, belts and watchbands. Suitable emergency safety shower facility should be available in work area.

**Eye contact:** Flush eyes thoroughly with water for several minutes. Remove contact lenses after the initial 1-2 minutes and continue flushing for several additional minutes. If effects occur, consult a physician, preferably an ophthalmologist.

**Ingestion:** Do not induce vomiting. Call a physician and/or transport to emergency facility immediately.

**4.2 Most important symptoms and effects, both acute and delayed:**

May be fatal if swallowed and enters airways. Causes skin irritation. May cause an allergic skin reaction.

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

**Notes to physician:** If burn is present, treat as any thermal burn, after decontamination. If lavage is performed, suggest endotracheal and/or esophageal control. Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach. The decision of whether to induce vomiting or not should be made by a physician. No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

---

## SECTION 5: FIREFIGHTING MEASURES

---

### 5.1 Extinguishing media

**Suitable extinguishing media:** Water fog or fine spray.. Dry chemical fire extinguishers.. Carbon dioxide fire extinguishers.. Foam.. General purpose synthetic foams (including AFFF type) or protein foams are preferred if available. Alcohol resistant foams (ATC type) may function..

**Unsuitable extinguishing media:** Do not use direct water stream.. May spread fire..

### 5.2 Special hazards arising from the substance or mixture

**Hazardous combustion products:** During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating.. Combustion products may include and are not limited to:.. Carbon monoxide.. Carbon dioxide..

**Unusual Fire and Explosion Hazards:** Violent steam generation or eruption may occur upon application of direct water stream to hot liquids.. Liquid mist of this product can burn.. Flammable concentrations of vapor can accumulate at temperatures above flash point; see Section 9.. Dense smoke is produced when product burns..

### 5.3 Advice for firefighters

**Fire Fighting Procedures:** Keep people away. Isolate fire and deny unnecessary entry.. Do not use direct water stream. May spread fire.. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage.. Contain fire water run-off if possible. Fire water run-off, if not contained, may cause environmental damage.. Review the "Accidental Release Measures" and the "Ecological Information" sections of this (M)SDS..

**Special protective equipment for firefighters:** Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves).. Avoid contact with this material during fire fighting operations. If contact is likely, change to full chemical resistant fire fighting clothing with self-

contained breathing apparatus. If this is not available, wear full chemical resistant clothing with self-contained breathing apparatus and fight fire from a remote location.. If protective equipment is not available or not used, fight fire from a protected location or safe distance..

---

## SECTION 6: ACCIDENTAL RELEASE MEASURES

---

**6.1 Personal precautions, protective equipment and emergency procedures:** Isolate area. Keep unnecessary and unprotected personnel from entering the area. Refer to section 7, Handling, for additional precautionary measures. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.

**6.2 Environmental precautions:** Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information. Spills or discharge to natural waterways is likely to kill aquatic organisms.

**6.3 Methods and materials for containment and cleaning up:** Contain spilled material if possible. Small spills: Absorb with materials such as: Non-combustible material. Collect in suitable and properly labeled containers. Large spills: Dike area to contain spill. Pump into suitable and properly labeled containers. Wash the spill site with water. See Section 13, Disposal Considerations, for additional information.

**6.4 Reference to other sections:** References to other sections, if applicable, have been provided in the previous sub-sections.

---

## SECTION 7: HANDLING AND STORAGE

---

**7.1 Precautions for safe handling:** Avoid contact with eyes, skin, and clothing. Do not swallow. Wash thoroughly after handling. See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.

**7.2 Conditions for safe storage, including any incompatibilities:** Store in the following material(s): Store in tightly closed container. Do not store in: Opened or unlabeled containers. See Section 10 for more specific information. Additional storage and handling information on this product may be obtained by calling your sales or customer service contact.

**7.3 Specific end use(s):** See the technical data sheet on this product for further information.

---

## SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

---

### 8.1 Control parameters

If exposure limits exist, they are listed below. If no exposure limits are displayed, then no values are applicable.

Component	Regulation	Type of listing	Value
Benzene, ethylenated, by-products from	US WEEL	TWA	1 ppm
	Dow IHG	TWA	4 ppm

### Recommended monitoring procedures

Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with the Occupational Exposure Limits and the adequacy of exposure controls. For some substances biological monitoring may also be appropriate. Validated exposure measurement methods should be applied by a competent person and samples should be analysed by an accredited laboratory.

Reference should be made to monitoring standards, such as the following: European Standard EN 689 (Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy); European Standard EN 14042 (Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents); European Standard EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents). Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

Examples of sources of recommended exposure measurement methods are given below or contact the supplier. Further national methods may be available.

National Institute of Occupational Safety and Health (NIOSH), USA: Manual of Analytical Methods. Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods. Health and Safety Executive (HSE), United Kingdom: Methods for the Determination of Hazardous Substances.

Institut für Arbeitsschutz Deutschen Gesetzlichen Unfallversicherung (IFA), Germany.

L'Institut National de Recherche et de Sécurité, (INRS), France.

#### Derived No Effect Level

Benzene, ethylenated, by-products from

##### Workers

<i>Acute systemic effects</i>		<i>Acute local effects</i>		<i>Long-term systemic effects</i>		<i>Long-term local effects</i>	
Dermal	Inhalation	Dermal	Inhalation	Dermal	Inhalation	Dermal	Inhalation
n.a.	n.a.	n.a.	n.a.	3,6 mg/kg bw/day	0,22 mg/m3	n.a.	n.a.

##### Consumers

<i>Acute systemic effects</i>			<i>Acute local effects</i>		<i>Long-term systemic effects</i>			<i>Long-term local effects</i>	
Dermal	Inhalation	Oral	Dermal	Inhalation	Dermal	Inhalation	Oral	Dermal	Inhalation
n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

#### Predicted No Effect Concentration

Benzene, ethylenated, by-products from

Compartment	PNEC
Fresh water	0,00003 mg/l
Marine water	0,000003 mg/l
Intermittent use/release	0,0003 mg/l
Sewage treatment plant	1 mg/l
Fresh water sediment	0,0015 mg/kg
Marine sediment	0,0015 mg/kg
Soil	0,003 mg/kg

## 8.2 Exposure controls

**Engineering controls:** Use local exhaust ventilation, or other engineering controls to maintain airborne levels below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, general ventilation should be sufficient for most operations.

#### Individual protection measures

**Eye/face protection:** Use safety glasses (with side shields). Safety glasses (with side shields) should be consistent with EN 166 or equivalent.

#### Skin protection

**Hand protection:** Use chemical resistant gloves classified under Standard EN374: Protective gloves against chemicals and micro-organisms. Examples of preferred glove barrier materials include: Polyethylene. Ethyl vinyl alcohol laminate ("EVAL"). Polyvinyl alcohol ("PVA"). Polyvinyl chloride ("PVC" or "vinyl"). Styrene/butadiene rubber. Viton. Examples of acceptable glove barrier materials include: Butyl rubber. Chlorinated polyethylene. Neoprene. Nitrile/butadiene rubber ("nitrile" or "NBR"). When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374) is recommended. When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374) is recommended. Glove thickness alone is not a good indicator of the level of protection a glove provides against a chemical substance as this level of protection is also highly dependent on the specific composition of the material that the glove is fabricated from. The thickness of the glove must, depending on model and type of material, generally be more than 0.35 mm to offer sufficient protection for prolonged and frequent contact with the substance. As an exception to this general rule it is known that multilayer laminate gloves may offer prolonged protection at thicknesses less than 0.35 mm. Other glove materials with a thickness of less than 0.35 mm may offer sufficient protection when only brief contact is expected. NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

**Other protection:** Use protective clothing chemically resistant to this material. Selection of specific items such as face shield, boots, apron, or full body suit will depend on the task.

**Respiratory protection:** Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. For most conditions no respiratory protection should be needed; however, if discomfort is experienced, use an approved air-purifying respirator. Use the following CE approved air-purifying respirator: Organic vapor cartridge with a particulate pre-filter, type AP2 (meeting standard EN 14387).

#### Environmental exposure controls

See SECTION 7: Handling and storage and SECTION 13: Disposal considerations for measures to prevent excessive environmental exposure during use and waste disposal.

---

## SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

---

### 9.1 Information on basic physical and chemical properties

#### Appearance

---

Physical state	Liquid.
Color	Colorless to yellow
Odor	Aromatic
Odor Threshold	No test data available
pH	Not applicable
Melting point/freezing point	
Melting point/ range	Not applicable to liquids
Freezing point	< -26 °C <i>Literature</i>
Boiling point or initial boiling point and boiling range	
Boiling point (760 mmHg)	267 °C <i>Literature</i>
Flash point	<b>closed cup</b> 121 °C <i>Setaflash Closed Cup ASTM D3828</i>
Flammability (solid, gas)	Not applicable to liquids
Flammability (liquids)	Not expected to be a static-accumulating flammable liquid.
Lower explosion limit	0,55 % vol <i>Literature</i>
Upper explosion limit	5,5 % vol <i>Literature</i>
Vapor Pressure	0,002 mmHg at 25 °C <i>Literature</i>
Relative Vapor Density (air = 1)	6,5 <i>Literature</i>
Relative Density (water = 1)	0,97 at 20 °C / 25 °C <i>Literature</i>
Solubility(ies)	
Water solubility	slightly soluble
Partition coefficient: n-octanol/water	log Pow: 4,08 - 6,01 <i>OECD Guideline 117 (Partition Coefficient (n-octanol / water), HPLC Method)</i>
Auto-ignition temperature	400 - 415 °C <i>ASTM E659</i>
Decomposition temperature	No test data available
Kinematic Viscosity	4,28 mm <sup>2</sup> /s at 24 °C <i>Literature</i>
Particle characteristics	
Particle size	Not applicable, liquid
<b>9.2 Other information</b>	
Molecular weight	190 g/mol <i>Literature Average</i>
Explosive properties	No data available
Oxidizing properties	No data available
Evaporation Rate (Butyl Acetate = 1)	<0,1 <i>Estimated.</i>

NOTE: The physical data presented above are typical values and should not be construed as a specification.

---

## SECTION 10: STABILITY AND REACTIVITY

---

**10.1 Reactivity:** No data available

**10.2 Chemical stability:** Thermally stable at typical use temperatures.

**10.3 Possibility of hazardous reactions:** Polymerization will not occur.

**10.4 Conditions to avoid:** Exposure to elevated temperatures can cause product to decompose.

**10.5 Incompatible materials:** Avoid contact with oxidizing materials.

**10.6 Hazardous decomposition products:** Decomposition products depend upon temperature, air supply and the presence of other materials.. Decomposition products can include and are not limited to:. Benzene..

---

## **SECTION 11: TOXICOLOGICAL INFORMATION**

---

*Toxicological information appears in this section when such data are available.*

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

#### **Information on likely routes of exposure**

Ingestion, Inhalation, Skin contact, Eye contact.

**Acute toxicity (represents short term exposures with immediate effects - no chronic/delayed effects known unless otherwise noted)**

#### **Acute Toxicity Endpoints:**

##### **Acute oral toxicity**

###### **Information for the Product:**

Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts.

Based on information for component(s):  
LD50, Rat, male and female, > 5 000 mg/kg

###### **Information for components:**

**Benzene, ethylenated, by-products from**  
LD50, Rat, male and female, > 5 000 mg/kg

##### **Acute dermal toxicity**

###### **Information for the Product:**

Prolonged skin contact is unlikely to result in absorption of harmful amounts.

Based on product testing:  
LD50, Rat, male, > 3 880 mg/kg

##### **Acute inhalation toxicity**

###### **Information for the Product:**

Prolonged exposure is not expected to cause adverse effects.

LC50, Rat, 1 Hour, vapour, > 1,6 mg/l OECD Test Guideline 403 No deaths occurred following exposure to a saturated atmosphere.

**Information for components:**

**Benzene, ethylenated, by-products from**

LC50, Rat, 1 Hour, vapour, > 1,6 mg/l OECD Test Guideline 403 No deaths occurred following exposure to a saturated atmosphere.

**Skin corrosion/irritation**

Causes skin irritation.

**Information for the Product:**

Based on product testing:

Brief contact may cause moderate skin irritation with local redness.

Repeated contact may cause skin burns. Symptoms may include pain, severe local redness, swelling, and tissue damage.

**Information for components:**

**Benzene, ethylenated, by-products from**

Brief contact may cause moderate skin irritation with local redness.

Repeated contact may cause skin burns. Symptoms may include pain, severe local redness, swelling, and tissue damage.

**Serious eye damage/eye irritation**

**Information for the Product:**

Based on product testing:

May cause slight eye irritation.

Corneal injury is unlikely.

**Information for components:**

**Benzene, ethylenated, by-products from**

May cause slight eye irritation.

Corneal injury is unlikely.

**Sensitization**

**For skin sensitization:**

May cause an allergic skin reaction.

**Information for the Product:**

For skin sensitization:

Based on product testing:

Has demonstrated the potential for contact allergy in mice.

For respiratory sensitization:  
Relevant data not available.

**Information for components:**

**Benzene, ethylenated, by-products from**

Has demonstrated the potential for contact allergy in mice.

For respiratory sensitization:  
Relevant data not available.

**Specific Target Organ Systemic Toxicity (Single Exposure)**

**Information for the Product:**

Evaluation of available data suggests that this material is not an STOT-SE toxicant.

**Information for components:**

**Benzene, ethylenated, by-products from**

Evaluation of available data suggests that this material is not an STOT-SE toxicant.

**Aspiration Hazard**

May be fatal if swallowed and enters airways.

**Information for the Product:**

Aspiration into the lungs may occur during ingestion or vomiting, causing lung damage or even death due to chemical pneumonia.

**Information for components:**

**Benzene, ethylenated, by-products from**

May be fatal if swallowed and enters airways.

**Chronic toxicity (represents longer term exposures with repeated dose resulting in chronic/delayed effects - no immediate effects known unless otherwise noted)**

**Specific Target Organ Systemic Toxicity (Repeated Exposure)**

**Information for the Product:**

Based on available data, repeated exposures are not anticipated to cause additional significant adverse effects.

**Information for components:**

**Benzene, ethylenated, by-products from**

Based on available data, repeated exposures are not anticipated to cause additional significant adverse effects.

## Carcinogenicity

### Information for the Product:

Relevant data not available.

### Information for components:

#### Benzene, ethylenated, by-products from

Relevant data not available.

## Teratogenicity

### Information for the Product:

Has caused birth defects in laboratory animals only at doses toxic to the mother. Has been toxic to the fetus in laboratory animals at doses toxic to the mother.

### Information for components:

#### Benzene, ethylenated, by-products from

Has caused birth defects in laboratory animals only at doses toxic to the mother. Has been toxic to the fetus in laboratory animals at doses toxic to the mother.

## Reproductive toxicity

### Information for the Product:

In animal studies, did not interfere with reproduction. In animal studies, did not interfere with fertility.

### Information for components:

#### Benzene, ethylenated, by-products from

In animal studies, did not interfere with reproduction. In animal studies, did not interfere with fertility.

## Mutagenicity

### Information for the Product:

In vitro genetic toxicity studies were negative.

### Information for components:

#### Benzene, ethylenated, by-products from

In vitro genetic toxicity studies were negative.

## 11.2 Information on other hazards

### Endocrine disrupting properties

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

### Information for components:

#### **Benzene, ethylenated, by-products from**

The substance is not considered to have endocrine disrupting properties according to REACH Article 57(f), Commission Regulation (EU) 2018/605 or Commission Delegated Regulation (EU) 2017/2100.

---

## SECTION 12: ECOLOGICAL INFORMATION

---

*Ecotoxicological information appears in this section when such data are available.*

### 12.1 Toxicity

#### **Acute toxicity to fish**

Material is very toxic to aquatic organisms (LC50/EC50/IC50 below 1 mg/L in the most sensitive species).

LC50, Rainbow trout (*Oncorhynchus mykiss*), flow-through, 96 Hour, > 0,97 mg/l

#### **Acute toxicity to aquatic invertebrates**

EC50, *Ceriodaphnia dubia* (water flea), static test, 48 Hour, 0,17 mg/l, OECD Test Guideline 202 or Equivalent

#### **Acute toxicity to algae/aquatic plants**

EC50, *Pseudokirchneriella subcapitata* (algae), static test, 72 Hour, Growth rate, 0,485 mg/l, OECD Test Guideline 201

NOEC, *Pseudokirchneriella subcapitata* (algae), static test, 72 Hour, Growth rate, 0,0959 mg/l, OECD Test Guideline 201

### 12.2 Persistence and degradability

**Biodegradability:** Based on stringent OECD test guidelines, this material cannot be considered as readily biodegradable; however, these results do not necessarily mean that the material is not biodegradable under environmental conditions. Material has inherent, primary biodegradability according to OECD test (s) guidelines (reaches > 20% biodegradation in OECD test(s)).

10-day Window: Fail

**Biodegradation:** 40,6 %

**Exposure time:** 29 d

**Method:** OECD Test Guideline 301B or Equivalent

### 12.3 Bioaccumulative potential

**Bioaccumulation:** Bioconcentration potential is moderate (BCF between 100 and 3000 or Log Pow between 3 and 5).

**Partition coefficient: n-octanol/water(log Pow):** 4,08 - 6,01 at 20 °C OECD Guideline 117  
(Partition Coefficient (n-octanol / water), HPLC Method)

#### 12.4 Mobility in soil

**Partition coefficient (Koc):** > 5000

#### 12.5 Results of PBT and vPvB assessment

This substance is not considered to be persistent, bioaccumulating and toxic (PBT). This substance is not considered to be very persistent and very bioaccumulating (vPvB).

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

#### Benzene, ethylenated, by-products from

The substance is not considered to have endocrine disrupting properties according to REACH Article 57(f), Commission Regulation (EU) 2018/605 or Commission Delegated Regulation (EU) 2017/2100.

#### 12.7 Other adverse effects

This substance is not on the Montreal Protocol list of substances that deplete the ozone layer.

---

## SECTION 13: DISPOSAL CONSIDERATIONS

---

### 13.1 Waste treatment methods

This product, when being disposed of in its unused and uncontaminated state should be treated as a hazardous waste according to EC Directive 2008/98/EC, provided it fulfils the criteria listed in Annex III of this directive. Any disposal practices must be in compliance with all national and provincial laws and any municipal or local by-laws governing hazardous waste. For used, contaminated and residual materials additional evaluations may be required. Do not dump into any sewers, on the ground, or into any body of water.

The definitive assignment of this material to the appropriate EWC group and thus its proper EWC code will depend on the use that is made of this material. Contact the authorized waste disposal services.

---

## SECTION 14: TRANSPORT INFORMATION

---

### Classification for ROAD and Rail transport (ADR/RID):

- |                                   |   |
|-----------------------------------|---|
| 14.1 UN number or ID number       | UN 3082   |
| 14.2 UN proper shipping name      | ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.(Benzene, ethylenated, by-products from) |
| 14.3 Transport hazard class(es)   | 9   |
| 14.4 Packing group                | III   |
| 14.5 Environmental hazards        | Benzene, ethylenated, by-products from  |
| 14.6 Special precautions for user |   |

Hazard Identification Number: 90

**Classification for INLAND waterways (ADNR/ADN):**

**Consult your Dow contact before transporting by inland waterway**

**Classification for SEA transport (IMO-IMDG):**

14.1 UN number or ID number	UN 3082
14.2 UN proper shipping name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S.(Benzene, ethylenated, by-products from)
14.3 Transport hazard class(es)	9
14.4 Packing group	III
14.5 Environmental hazards	Benzene, ethylenated, by-products from
14.6 Special precautions for user	EmS: F-A, S-F
14.7 Maritime transport in bulk according to IMO instruments	Consult IMO regulations before transporting ocean bulk

**Classification for AIR transport (IATA/ICAO):**

14.1 UN number or ID number	UN 3082
14.2 UN proper shipping name	Environmentally hazardous substance, liquid, n.o.s.(Benzene, ethylenated, by-products from)
14.3 Transport hazard class(es)	9
14.4 Packing group	III
14.5 Environmental hazards	Not applicable
14.6 Special precautions for user	No data available.

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Transportation classifications may vary by container volume and may be influenced by regional or country variations in regulations. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

---

## **SECTION 15: REGULATORY INFORMATION**

---

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

#### **REACH Regulation (EC) No 1907/2006**

This product contains only components that have been either registered, are exempt from registration, are regarded as registered or are not subject to registration according to Regulation (EC) No.

1907/2006 (REACH)., The aforementioned indications of the REACH registration status are provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. It is the buyer’s/user’s responsibility to ensure that his/her understanding of the regulatory status of this product is correct.

**REACH - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles (Annex XVII)**

Conditions of restriction for the following entries should be considered:  
Number on list 3

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

Listed in Regulation: ENVIRONMENTAL HAZARDS

Number in Regulation: E1

100 t

200 t

ABM (Algemene Beoordelingsmethodiek): Please contact our product stewardship specialist via the Customer Information contact details in Section 1 for information on the assessment of substances and preparations within the context of the implementation of the water discharge policy.

**Further information**

Take note of Directive 94/33/EC on the protection of young people at work or stricter national regulations, where applicable.

**15.2 Chemical safety assessment**

No Chemical Safety Assessment has been carried out for this substance/mixture.

**SECTION 16: OTHER INFORMATION**

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

- H304 May be fatal if swallowed and enters airways.
- H315 Causes skin irritation.
- H317 May cause an allergic skin reaction.
- H400 Very toxic to aquatic life.
- H410 Very toxic to aquatic life with long lasting effects.

**Revision**

Identification Number: 39467 / A281 / Issue Date: 09.01.2025 / Version: 3.0

In case this version of the SDS contains significant changes from the previous version, they are listed below or noted by bold, double bars in the left-hand margin throughout this document.

Changes encompass identification, hazards, tox/eco-tox information and the addition/removal of the ingredients, and regulatory information, hazard information, uses, risk management measures and other key regulatory changes of the product. Detailed explanation of the changes can be obtained upon request.

**Legend**

Dow IHG	Dow Industrial Hygiene Guideline
TWA	8-hr TWA
US WEEL	USA. Workplace Environmental Exposure Levels (WEEL)

Aquatic Acute	Short-term (acute) aquatic hazard
Aquatic Chronic	Long-term (chronic) aquatic hazard
Asp. Tox.	Aspiration hazard
Skin Irrit.	Skin irritation
Skin Sens.	Skin sensitisation

### Full text of other abbreviations

ADN - European Agreement concerning the International Carriage of Dangerous Goods by Inland Waterways; ADR - Agreement concerning the International Carriage of Dangerous Goods by Road; AIIIC - Australian Inventory of Industrial Chemicals; ASTM - American Society for the Testing of Materials; bw - Body weight; CLP - Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); ECHA - European Chemicals Agency; EC-Number - European Community number; ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; RID - Regulations concerning the International Carriage of Dangerous Goods by Rail; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; SVHC - Substance of Very High Concern; TCSI - Taiwan Chemical Substance Inventory; TECI - Thailand Existing Chemicals Inventory; TRGS - Technical Rule for Hazardous Substances; TSCA - Toxic Substances Control Act (United States); UN - United Nations; vPvB - Very Persistent and Very Bioaccumulative

### Information Source and References

This SDS is prepared by Product Regulatory Services and Hazard Communications Groups from information supplied by internal references within our company.

DOW BENELUX B.V. urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to

the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.

NL

## Annex

### Exposure Scenario

Number	Title
ES1	Manufacture; Manufacture of substance
ES2	Formulation or re-packing; Formulation & (re)packing of substances and mixtures
ES3	Use at industrial sites; Use in functional fluids
ES4	Use at industrial sites; Use in fuel
ES5	Use at industrial sites; Use in process chemicals

**ES1: Manufacture of substance****1.1. Title section**

<b>Structured Short Title</b>	: Manufacture
<b>Substance</b>	: Benzene, ethylenated, by-products from EC-No.: 271-802-8

Environment		
<b>CS1</b>	<b>Manufacture of the substance</b>	ERC1
Worker		
<b>CS2</b>	<b>General measures (skin irritants)</b>	CS135
<b>CS3</b>	<b>Material transfers, Dedicated facility</b>	PROC8b
<b>CS4</b>	<b>Material transfers, Dedicated facility</b>	PROC8b
<b>CS5</b>	<b>Material transfers, Dedicated facility</b>	PROC8b
<b>CS6</b>	<b>Use in contained systems</b>	PROC1
<b>CS7</b>	<b>Product sampling, (closed systems)</b>	PROC3
<b>CS8</b>	<b>Product sampling, (closed systems)</b>	PROC3
<b>CS9</b>	<b>Equipment cleaning and maintenance</b>	PROC8a
<b>CS10</b>	<b>Equipment cleaning and maintenance</b>	PROC8a
<b>CS11</b>	<b>Equipment cleaning and maintenance</b>	PROC8a
<b>CS12</b>	<b>Bulk product storage, (closed systems)</b>	PROC1
<b>CS13</b>	<b>Laboratory activities</b>	PROC15

**1.2. Conditions of use affecting exposure****1.2.1. Control of environmental exposure: Manufacture of the substance (ERC1)**

<b>Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply</b>
Site should have a spill plan to ensure that adequate safeguards are in place to minimize the impact of episodic releases.

**1.2.2. Control of worker exposure: General measures (skin irritants) (CS135)**

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. Avoid direct eye contact with product, also via contamination on hands.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Use suitable eye protection.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

### 1.2.3. Control of worker exposure: Material transfers, Dedicated facility (PROC8b)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers use up to 240 min
<b>Technical and organisational conditions and measures</b>	
Clear transfer lines prior to de-coupling. Ensure operation is undertaken outdoors.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374.	
<b>Other conditions affecting workers exposure</b>	

Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

**1.2.4. Control of worker exposure: Material transfers, Dedicated facility (PROC8b)**

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Clear transfer lines prior to de-coupling.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear a respirator conforming to EN140 with Type A filter or better.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

**1.2.5. Control of worker exposure: Material transfers, Dedicated facility (PROC8b)**

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Ensure material transfers are under containment or extract ventilation.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	

Wear suitable gloves tested to EN374.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

#### 1.2.6. Control of worker exposure: Use in contained systems (PROC1)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
No other specific measures identified.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

#### 1.2.7. Control of worker exposure: Product sampling, (closed systems) (PROC3)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers use up to 60 min
<b>Technical and organisational conditions and measures</b>	
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Ensure operation is undertaken outdoors.	

<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

### 1.2.8. Control of worker exposure: Product sampling, (closed systems) (PROC3)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Use a sampling system designed to control exposure	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear a respirator conforming to EN140 with Type A filter or better.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

### 1.2.9. Control of worker exposure: Equipment cleaning and maintenance (PROC8a)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers use up to 60 min
<b>Technical and organisational conditions and measures</b>	
Ensure that enough fresh air is supplied to dilute and remove dusts, fumes or vapours. Between 5 and	

15 air changes per hour are recommended, with a through draught. Drain down system prior to equipment break-in or maintenance	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

**1.2.10. Control of worker exposure: Equipment cleaning and maintenance (PROC8a)**

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Drain down system prior to equipment break-in or maintenance Ensure that enough fresh air is supplied to dilute and remove dusts, fumes or vapours. Between 5 and 15 air changes per hour are recommended, with a through draught.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374. Wear a respirator conforming to EN140 with Type A filter or better.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

**1.2.11. Control of worker exposure: Equipment cleaning and maintenance (PROC8a)**

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	

Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Ensure operation is undertaken outdoors.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear a full face respirator conforming to EN140 with Type A filter or better.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

**1.2.12. Control of worker exposure: Bulk product storage, (closed systems) (PROC1)**

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
No other specific measures identified.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

**1.2.13. Control of worker exposure: Laboratory activities (PROC15)**

<b>Product (article) characteristics</b>
--

Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Handle in a fume cupboard or under extract ventilation.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

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

#### 1.3.3. Worker exposure: Material transfers, Dedicated facility (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	3,33 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,83
dermal	systemic	long-term	1,37 mg/kg bw/day	0,15
combined routes				0,99
inhalative	systemic	short-term	3,33 mg/m <sup>3</sup>	0,10

#### 1.3.4. Worker exposure: Material transfers, Dedicated facility (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	0,79 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,20
dermal	systemic	long-term	6,86 mg/kg bw/day	0,77
combined routes				0,97
inhalative	systemic	short-term	0,79 mg/m <sup>3</sup>	0,02

#### 1.3.5. Worker exposure: Material transfers, Dedicated facility (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	1,19 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,30
dermal	systemic	long-term	1,37 mg/kg bw/day	0,15
combined routes				0,45
inhalative	systemic	short-term	1,19 mg/m <sup>3</sup>	0,04

### 1.3.6. Worker exposure: Use in contained systems (PROC1)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	0,08 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,02
dermal	systemic	long-term	0,34 mg/kg bw/day	0,04
combined routes				0,06
inhalative	systemic	short-term	0,08 mg/m <sup>3</sup>	

### 1.3.7. Worker exposure: Product sampling, (closed systems) (PROC3)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	3,33 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,83
dermal	systemic	long-term	0,34 mg/kg bw/day	0,04
combined routes				0,87
inhalative	systemic	short-term	3,33 mg/m <sup>3</sup>	0,10

### 1.3.8. Worker exposure: Product sampling, (closed systems) (PROC3)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	2,38 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,59
dermal	systemic	long-term	0,34 mg/kg bw/day	0,04
combined routes				0,63
inhalative	systemic	short-term	2,38 mg/m <sup>3</sup>	0,07

**1.3.9. Worker exposure: Equipment cleaning and maintenance (PROC8a)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	2,22 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,55
dermal	systemic	long-term	2,74 mg/kg bw/day	0,31
combined routes				0,86
inhalative	systemic	short-term	2,22 mg/m <sup>3</sup>	0,07

**1.3.10. Worker exposure: Equipment cleaning and maintenance (PROC8a)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	2,38 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,59
dermal	systemic	long-term	2,74 mg/kg bw/day	0,31
combined routes				0,90
inhalative	systemic	short-term	2,22 mg/m <sup>3</sup>	0,05

**1.3.11. Worker exposure: Equipment cleaning and maintenance (PROC8a)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	2,77 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,69
dermal	systemic	long-term	1,37 mg/kg bw/day	0,31
combined routes				0,85
inhalative	systemic	short-term	2,77 mg/m <sup>3</sup>	0,08

**1.3.12. Worker exposure: Bulk product storage, (closed systems) (PROC1)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	0,08 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,02
dermal	systemic	long-term	1,37 mg/kg bw/day	0,15
combined routes				0,17
inhalative	systemic	short-term	0,08 mg/m <sup>3</sup>	

**1.3.13. Worker exposure: Laboratory activities (PROC15)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	1,90 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,30
dermal	systemic	long-term	0,34 mg/kg bw/day	0,04
combined routes				0,34
inhalative	systemic	short-term	1,90 mg/m <sup>3</sup>	0,04

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

Health - Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Environment - Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Further details on scaling and control technologies are provided in SpERC factsheet <http://cefic.org/en/reach-for-industries-libraries.html>.

---

**ES2: Formulation & (re)packing of substances and mixtures**
**2.1. Title section**

<b>Structured Short Title</b>	: Formulation or re-packing
<b>Substance</b>	: Benzene, ethylenated, by-products from EC-No.: 271-802-8

Environment		
<b>CS1</b>	<b>Formulation into mixture</b>	ERC2
Worker		
<b>CS2</b>	<b>General measures (skin irritants)</b>	CS135
<b>CS3</b>	<b>Material transfers, Dedicated facility</b>	PROC8b
<b>CS4</b>	<b>Material transfers, Dedicated facility</b>	PROC8b
<b>CS5</b>	<b>Material transfers, Dedicated facility</b>	PROC8b
<b>CS6</b>	<b>Drum and small package filling, Dedicated facility</b>	PROC9
<b>CS7</b>	<b>Product sampling, (closed systems)</b>	PROC3
<b>CS8</b>	<b>Product sampling, (closed systems)</b>	PROC3
<b>CS9</b>	<b>Equipment cleaning and maintenance</b>	PROC8a
<b>CS10</b>	<b>Equipment cleaning and maintenance</b>	PROC8a
<b>CS11</b>	<b>Equipment cleaning and maintenance</b>	PROC8a
<b>CS12</b>	<b>Bulk product storage, (closed systems)</b>	PROC1
<b>CS13</b>	<b>Disposal of wastes</b>	PROC1
<b>CS14</b>	<b>Laboratory activities</b>	PROC15

**2.2. Conditions of use affecting exposure****2.2.1. Control of environmental exposure: Formulation into mixture (ERC2)**

<b>Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply</b>
Site should have a spill plan to ensure that adequate safeguards are in place to minimize the impact of episodic releases.

**2.2.2. Control of worker exposure: General measures (skin irritants) (CS135)**

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. Avoid direct eye contact with product, also via contamination on hands.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Use suitable eye protection.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

### 2.2.3. Control of worker exposure: Material transfers, Dedicated facility (PROC8b)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers use up to 240 min
<b>Technical and organisational conditions and measures</b>	
Clear transfer lines prior to de-coupling. Ensure operation is undertaken outdoors.	
Ensure material transfers are under containment or extract ventilation.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374.	

<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

#### 2.2.4. Control of worker exposure: Material transfers, Dedicated facility (PROC8b)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Clear transfer lines prior to de-coupling.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear a respirator conforming to EN140 with Type A filter or better.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

#### 2.2.5. Control of worker exposure: Material transfers, Dedicated facility (PROC8b)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Ensure operation is undertaken outdoors.	

<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

#### 2.2.6. Control of worker exposure: Drum and small package filling, Dedicated facility (PROC9)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Ensure material transfers are under containment or extract ventilation.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

#### 2.2.7. Control of worker exposure: Product sampling, (closed systems) (PROC3)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers use up to 60 min

<b>Technical and organisational conditions and measures</b>	
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Ensure operation is undertaken outdoors.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

**2.2.8. Control of worker exposure: Product sampling, (closed systems) (PROC3)**

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Use a sampling system designed to control exposure	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

**2.2.9. Control of worker exposure: Equipment cleaning and maintenance (PROC8a)**

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	

Ensure that enough fresh air is supplied to dilute and remove dusts, fumes or vapours. Between 5 and 15 air changes per hour are recommended, with a through draught. Drain down system prior to equipment break-in or maintenance Ensure operation is undertaken outdoors.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374. Wear a respirator conforming to EN140 with Type A filter or better.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

**2.2.10. Control of worker exposure: Equipment cleaning and maintenance (PROC8a)**

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Ensure that enough fresh air is supplied to dilute and remove dusts, fumes or vapours. Between 5 and 15 air changes per hour are recommended, with a through draught. Drain down system prior to equipment break-in or maintenance Ensure operation is undertaken outdoors.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

**2.2.11. Control of worker exposure: Equipment cleaning and maintenance (PROC8a)**

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Ensure operation is undertaken outdoors.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

#### 2.2.12. Control of worker exposure: Bulk product storage, (closed systems) (PROC1)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
No other specific measures identified.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

**2.2.13. Control of worker exposure: Disposal of wastes (PROC1)**

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
No other specific measures identified.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

**2.2.14. Control of worker exposure: Laboratory activities (PROC15)**

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Handle in a fume cupboard or under extract ventilation.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

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

**2.3.3. Worker exposure: Material transfers, Dedicated facility (PROC8b)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	3,33 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,83
dermal	systemic	long-term	1,37 mg/kg bw/day	0,15
combined routes				0,99
inhalative	systemic	short-term	3,33 mg/m <sup>3</sup>	0,10

**2.3.4. Worker exposure: Material transfers, Dedicated facility (PROC8b)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	0,79 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,20
dermal	systemic	long-term	6,86 mg/kg bw/day	0,77
combined routes				0,97
inhalative	systemic	short-term	0,79 mg/m <sup>3</sup>	0,02

**2.3.5. Worker exposure: Material transfers, Dedicated facility (PROC8b)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	1,19 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,30
dermal	systemic	long-term	1,37 mg/kg bw/day	0,15
combined routes				0,45
inhalative	systemic	short-term	1,19 mg/m <sup>3</sup>	0,04

**2.3.6. Worker exposure: Drum and small package filling, Dedicated facility (PROC9)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	2,77 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,69
dermal	systemic	long-term	1,37 mg/kg bw/day	0,15
combined routes				0,85

inhalative	systemic	short-term	2,77 mg/m <sup>3</sup>	0,08
------------	----------	------------	------------------------	------

**2.3.7. Worker exposure: Product sampling, (closed systems) (PROC3)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	3,33 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,83
dermal	systemic	long-term	0,34 mg/kg bw/day	0,04
combined routes				0,87
inhalative	systemic	short-term	3,33 mg/m <sup>3</sup>	0,10

**2.3.8. Worker exposure: Product sampling, (closed systems) (PROC3)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	2,38 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,59
dermal	systemic	long-term	0,34 mg/kg bw/day	0,04
combined routes				0,63
inhalative	systemic	short-term	2,38 mg/m <sup>3</sup>	0,07

**2.3.9. Worker exposure: Equipment cleaning and maintenance (PROC8a)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	2,22 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,55
dermal	systemic	long-term	2,74 mg/kg bw/day	0,31
combined routes				0,86
inhalative	systemic	short-term	2,22 mg/m <sup>3</sup>	0,07

**2.3.10. Worker exposure: Equipment cleaning and maintenance (PROC8a)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	2,38 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,59
dermal	systemic	long-term	2,74 mg/kg bw/day	0,31

combined routes				0,90
inhalative	systemic	short-term	2,38 mg/m <sup>3</sup>	0,05

**2.3.11. Worker exposure: Equipment cleaning and maintenance (PROC8a)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	2,77 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,69
dermal	systemic	long-term	1,37 mg/kg bw/day	0,15
combined routes				0,85
inhalative	systemic	short-term	2,77 mg/m <sup>3</sup>	0,08

**2.3.12. Worker exposure: Bulk product storage, (closed systems) (PROC1)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	0,08 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,02
dermal	systemic	long-term	0,34 mg/kg bw/day	0,04
combined routes				0,06
inhalative	systemic	short-term	0,08 mg/m <sup>3</sup>	

**2.3.13. Worker exposure: Disposal of wastes (PROC1)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	0,08 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,02
dermal	systemic	long-term	1,37 mg/kg bw/day	0,15
combined routes				0,17
inhalative	systemic	short-term	0,08 mg/m <sup>3</sup>	

**2.3.14. Worker exposure: Laboratory activities (PROC15)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	1,19 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,30

dermal	systemic	long-term	0,34 mg/kg bw/day	0,04
combined routes				0,34
inhalative	systemic	short-term	1,19 mg/m <sup>3</sup>	0,04

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

Health - Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Environment - Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Further details on scaling and control technologies are provided in SpERC factsheet <http://cefic.org/en/reach-for-industries-libraries.html>.

**ES3: Use in functional fluids****3.1. Title section**

<b>Structured Short Title</b>	: Use at industrial sites
<b>Substance</b>	: Benzene, ethylenated, by-products from EC-No.: 271-802-8

<b>Environment</b>		
<b>CS1</b>	<b>Use of functional fluid at industrial site</b>	<b>ERC7</b>
<b>Worker</b>		
<b>CS2</b>	<b>General measures (skin irritants)</b>	<b>CS135</b>
<b>CS3</b>	<b>Material transfers, Dedicated facility</b>	<b>PROC8b</b>
<b>CS4</b>	<b>Material transfers, Dedicated facility</b>	<b>PROC8b</b>
<b>CS5</b>	<b>Material transfers, Dedicated facility</b>	<b>PROC8b</b>
<b>CS6</b>	<b>Filling of articles/equipment, Material transfers, Dedicated facility</b>	<b>PROC8b</b>
<b>CS7</b>	<b>Filling of articles/equipment, Material transfers, Dedicated facility</b>	<b>PROC8b</b>
<b>CS8</b>	<b>Filling of articles/equipment, Material transfers, Dedicated facility</b>	<b>PROC8b</b>
<b>CS9</b>	<b>Filling of articles/equipment, Material transfers, Dedicated facility</b>	<b>PROC9</b>
<b>CS10</b>	<b>General exposures (closed systems)</b>	<b>PROC1</b>
<b>CS11</b>	<b>General exposures, Use in contained batch processes</b>	<b>PROC3</b>
<b>CS12</b>	<b>General exposures, Use in contained batch processes</b>	<b>PROC3</b>
<b>CS13</b>	<b>Product sampling, (closed systems)</b>	<b>PROC3</b>
<b>CS14</b>	<b>Product sampling, (closed systems)</b>	<b>PROC3</b>
<b>CS15</b>	<b>General exposures, Use in contained batch processes</b>	<b>PROC3</b>
<b>CS16</b>	<b>Equipment cleaning and maintenance</b>	<b>PROC8a</b>
<b>CS17</b>	<b>Equipment cleaning and maintenance</b>	<b>PROC8a</b>
<b>CS18</b>	<b>Equipment cleaning and maintenance</b>	<b>PROC8a</b>
<b>CS19</b>	<b>Bulk product storage, (closed systems)</b>	<b>PROC1</b>
<b>CS20</b>	<b>Laboratory activities</b>	<b>PROC15</b>

### 3.2. Conditions of use affecting exposure

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

**Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply**

Site should have a spill plan to ensure that adequate safeguards are in place to minimize the impact of episodic releases.

#### 3.2.2. Control of worker exposure: General measures (skin irritants) (CS135)

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
Amount used (or contained in articles), frequency and duration of use/exposure	
Duration	: Covers daily exposures up to 8 hours
Technical and organisational conditions and measures	
<p>Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop.</p> <p>Avoid direct eye contact with product, also via contamination on hands.</p>	
Conditions and measures related to personal protection, hygiene and health evaluation	
Use suitable eye protection.	
Other conditions affecting workers exposure	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

#### 3.2.3. Control of worker exposure: Material transfers, Dedicated facility (PROC8b)

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP

<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers use up to 240 min
<b>Technical and organisational conditions and measures</b>	
Clear transfer lines prior to de-coupling. Ensure material transfers are under containment or extract ventilation.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

#### 3.2.4. Control of worker exposure: Material transfers, Dedicated facility (PROC8b)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Clear transfer lines prior to de-coupling.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear a respirator conforming to EN140 with Type A filter or better.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

#### 3.2.5. Control of worker exposure: Material transfers, Dedicated facility (PROC8b)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Ensure material transfers are under containment or extract ventilation.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

### 3.2.6. Control of worker exposure: Filling of articles/equipment, Material transfers, Dedicated facility (PROC8b)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers use up to 240 min
<b>Technical and organisational conditions and measures</b>	
Clear transfer lines prior to de-coupling. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374. Wear a respirator conforming to EN140 with Type A filter or better.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).

ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented

**3.2.7. Control of worker exposure: Filling of articles/equipment, Material transfers, Dedicated facility (PROC8b)**

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Clear transfer lines prior to de-coupling.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374.	
Wear a respirator conforming to EN140 with Type A filter or better.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

**3.2.8. Control of worker exposure: Filling of articles/equipment, Material transfers, Dedicated facility (PROC8b)**

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Ensure material transfers are under containment or extract ventilation.	

<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

### 3.2.9. Control of worker exposure: Filling of articles/equipment, Material transfers, Dedicated facility (PROC9)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Ensure material transfers are under containment or extract ventilation. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

### 3.2.10. Control of worker exposure: General exposures (closed systems) (PROC1)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	

Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
No other specific measures identified.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

### 3.2.11. Control of worker exposure: General exposures, Use in contained batch processes (PROC3)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers use up to 60 min
<b>Technical and organisational conditions and measures</b>	
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Ensure operation is undertaken outdoors.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

### 3.2.12. Control of worker exposure: General exposures, Use in contained batch processes (PROC3)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	

Duration	: Covers use up to 60 min
<b>Technical and organisational conditions and measures</b>	
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Ensure operation is undertaken outdoors.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear a respirator conforming to EN140 with Type A filter or better.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

**3.2.13. Control of worker exposure: Product sampling, (closed systems) (PROC3)**

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers use up to 60 min
<b>Technical and organisational conditions and measures</b>	
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Ensure operation is undertaken outdoors.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear a respirator conforming to EN140 with Type A filter or better.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

**3.2.14. Control of worker exposure: Product sampling, (closed systems) (PROC3)**

<b>Product (article) characteristics</b>
--

Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Use a sampling system designed to control exposure	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

### 3.2.15. Control of worker exposure: General exposures, Use in contained batch processes (PROC3)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear a respirator conforming to EN140 with Type A filter or better.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

### 3.2.16. Control of worker exposure: Equipment cleaning and maintenance (PROC8a)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP

<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers use up to 60 min
<b>Technical and organisational conditions and measures</b>	
<p>Drain down system prior to equipment break-in or maintenance          Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour).          Ensure that enough fresh air is supplied to dilute and remove dusts, fumes or vapours. Between 5 and 15 air changes per hour are recommended, with a through draught.          Ensure operation is undertaken outdoors.</p>	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

### 3.2.17. Control of worker exposure: Equipment cleaning and maintenance (PROC8a)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers use up to 60 min
<b>Technical and organisational conditions and measures</b>	
<p>Ensure that enough fresh air is supplied to dilute and remove dusts, fumes or vapours. Between 5 and 15 air changes per hour are recommended, with a through draught.          Drain down system prior to equipment break-in or maintenance</p>	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
<p>Wear suitable gloves tested to EN374.          Wear a respirator conforming to EN140 with Type A filter or better.</p>	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).

Assumes a good basic standard of occupational hygiene is implemented
--

**3.2.18. Control of worker exposure: Equipment cleaning and maintenance (PROC8a)**

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Drain down system prior to equipment break-in or maintenance Ensure operation is undertaken outdoors.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374. Wear a respirator conforming to EN140 with Type A filter or better. Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

**3.2.19. Control of worker exposure: Bulk product storage, (closed systems) (PROC1)**

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
No other specific measures identified.	

Other conditions affecting workers exposure	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

### 3.2.20. Control of worker exposure: Laboratory activities (PROC15)

Product (article) characteristics	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
Amount used (or contained in articles), frequency and duration of use/exposure	
Duration	: Covers daily exposures up to 8 hours
Technical and organisational conditions and measures	
Handle in a fume cupboard or under extract ventilation.	
Other conditions affecting workers exposure	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

## 3.3. Exposure estimation and reference to its source

### 3.3.3. Worker exposure: Material transfers, Dedicated facility (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	3,33 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,83
dermal	systemic	long-term	1,37 mg/kg bw/day	0,15
combined routes				0,99
inhalative	systemic	short-term	3,33 mg/m <sup>3</sup>	0,10

### 3.3.4. Worker exposure: Material transfers, Dedicated facility (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	0,79 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,20
dermal	systemic	long-term	6,86 mg/kg bw/day	0,77
combined routes				0,97
inhalative	systemic	short-term	0,79 mg/m <sup>3</sup>	0,02

### 3.3.5. Worker exposure: Material transfers, Dedicated facility (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	1,19 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,30
dermal	systemic	long-term	1,37 mg/kg bw/day	0,15
combined routes				0,45
inhalative	systemic	short-term	1,19 mg/m <sup>3</sup>	0,04

### 3.3.6. Worker exposure: Filling of articles/equipment, Material transfers, Dedicated facility (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	3,33 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,83
dermal	systemic	long-term	1,37 mg/kg bw/day	0,15
combined routes				0,99
inhalative	systemic	short-term	3,33 mg/m <sup>3</sup>	0,10

### 3.3.7. Worker exposure: Filling of articles/equipment, Material transfers, Dedicated facility (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	0,79 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,20
dermal	systemic	long-term	6,86 mg/kg bw/day	0,77
combined routes				0,97
inhalative	systemic	short-term	0,79 mg/m <sup>3</sup>	0,02

**3.3.8. Worker exposure: Filling of articles/equipment, Material transfers, Dedicated facility (PROC8b)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	1,19 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,30
dermal	systemic	long-term	1,37 mg/kg bw/day	0,15
combined routes				0,45
inhalative	systemic	short-term	1,19 mg/m <sup>3</sup>	0,04

**3.3.9. Worker exposure: Filling of articles/equipment, Material transfers, Dedicated facility (PROC9)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	2,77 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,69
dermal	systemic	long-term	1,37 mg/kg bw/day	0,15
combined routes				0,85
inhalative	systemic	short-term	2,77 mg/m <sup>3</sup>	0,08

**3.3.10. Worker exposure: General exposures (closed systems) (PROC1)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	0,08 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,02
dermal	systemic	long-term	0,34 mg/kg bw/day	0,04
combined routes				0,06
inhalative	systemic	short-term	0,08 mg/m <sup>3</sup>	

**3.3.11. Worker exposure: General exposures, Use in contained batch processes (PROC3)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	3,33 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,83
dermal	systemic	long-term	0,34 mg/kg bw/day	0,04

combined routes				0,87
inhalative	systemic	short-term	3,33 mg/m <sup>3</sup>	0,10

**3.3.12. Worker exposure: General exposures, Use in contained batch processes (PROC3)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	2,38 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,59
dermal	systemic	long-term	0,34 mg/kg bw/day	0,04
combined routes				0,63
inhalative	systemic	short-term	2,38 mg/m <sup>3</sup>	0,07

**3.3.13. Worker exposure: Product sampling, (closed systems) (PROC3)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	3,33 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,83
dermal	systemic	long-term	0,34 mg/kg bw/day	0,04
combined routes				0,87
inhalative	systemic	short-term	3,33 mg/m <sup>3</sup>	0,10

**3.3.14. Worker exposure: Product sampling, (closed systems) (PROC3)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	3,80 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,95
dermal	systemic	long-term	0,34 mg/kg bw/day	0,04
combined routes				0,99
inhalative	systemic	short-term	3,80 mg/m <sup>3</sup>	0,12

**3.3.15. Worker exposure: General exposures, Use in contained batch processes (PROC3)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	2,38 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,59

dermal	systemic	long-term	0,34 mg/kg bw/day	0,04
combined routes				0,63
inhalative	systemic	short-term	2,38 mg/m <sup>3</sup>	0,07

**3.3.16. Worker exposure: Equipment cleaning and maintenance (PROC8a)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	2,22 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,55
dermal	systemic	long-term	2,74 mg/kg bw/day	0,31
combined routes				0,86
inhalative	systemic	short-term	2,22 mg/m <sup>3</sup>	0,07

**3.3.17. Worker exposure: Equipment cleaning and maintenance (PROC8a)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	2,38 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,59
dermal	systemic	long-term	2,74 mg/kg bw/day	0,31
combined routes				0,90
inhalative	systemic	short-term	2,38 mg/m <sup>3</sup>	0,05

**3.3.18. Worker exposure: Equipment cleaning and maintenance (PROC8a)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	2,77 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,69
dermal	systemic	long-term	1,37 mg/kg bw/day	0,15
combined routes				0,84
inhalative	systemic	short-term	2,77 mg/m <sup>3</sup>	0,08

**3.3.19. Worker exposure: Bulk product storage, (closed systems) (PROC1)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	0,08 mg/m <sup>3</sup> (ECETOC TRA)	0,02

			worker v2.0)	
dermal	systemic	long-term	0,34 mg/kg bw/day	0,04
combined routes				0,06
inhalative	systemic	short-term	0,08 mg/m <sup>3</sup>	

### 3.3.20. Worker exposure: Laboratory activities (PROC15)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	1,19 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,30
dermal	systemic	long-term	0,34 mg/kg bw/day	0,04
combined routes				0,34
inhalative	systemic	short-term	1,19 mg/m <sup>3</sup>	0,04

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

Health - Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Environment - Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Further details on scaling and control technologies are provided in SpERC factsheet <http://cefic.org/en/reach-for-industries-libraries.html>.

**ES4: Use in fuel****4.1. Title section**

<b>Structured Short Title</b>	: Use at industrial sites
<b>Substance</b>	: Benzene, ethylenated, by-products from EC-No.: 271-802-8

Environment		
<b>CS1</b>	<b>Use of functional fluid at industrial site</b>	ERC7
Worker		
<b>CS2</b>	<b>General measures (skin irritants)</b>	CS135
<b>CS3</b>	<b>Material transfers, Dedicated facility</b>	PROC8b
<b>CS4</b>	<b>Material transfers, Dedicated facility</b>	PROC8b
<b>CS5</b>	<b>Material transfers, Dedicated facility</b>	PROC8b
<b>CS6</b>	<b>General exposures, Use in contained batch processes, With sample collection</b>	PROC3
<b>CS7</b>	<b>General exposures, Use in contained batch processes, With sample collection</b>	PROC3
<b>CS8</b>	<b>Use in contained systems</b>	PROC16
<b>CS9</b>	<b>General exposures, Continuous process, (closed systems)</b>	PROC1
<b>CS10</b>	<b>Product sampling, (closed systems)</b>	PROC3
<b>CS11</b>	<b>Product sampling, (closed systems)</b>	PROC3
<b>CS12</b>	<b>Equipment cleaning and maintenance, Vessel and container cleaning</b>	PROC8a
<b>CS13</b>	<b>Equipment cleaning and maintenance, Vessel and container cleaning</b>	PROC8a
<b>CS14</b>	<b>Equipment cleaning and maintenance, Vessel and container cleaning</b>	PROC8a
<b>CS15</b>	<b>Bulk product storage, (closed systems)</b>	PROC1
<b>CS16</b>	<b>Laboratory activities</b>	PROC15

**4.2. Conditions of use affecting exposure****4.2.1. Control of environmental exposure: Use of functional fluid at industrial site (ERC7)**

<b>Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply</b>
Site should have a spill plan to ensure that adequate safeguards are in place to minimize the impact of

episodic releases.

#### 4.2.2. Control of worker exposure: General measures (skin irritants) (CS135)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. Avoid direct eye contact with product, also via contamination on hands.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Use suitable eye protection.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

#### 4.2.3. Control of worker exposure: Material transfers, Dedicated facility (PROC8b)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers use up to 240 min
<b>Technical and organisational conditions and measures</b>	
Clear transfer lines prior to de-coupling. Ensure operation is undertaken outdoors.	

<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

#### 4.2.4. Control of worker exposure: Material transfers, Dedicated facility (PROC8b)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Clear transfer lines prior to de-coupling.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear a respirator conforming to EN140 with Type A filter or better.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

#### 4.2.5. Control of worker exposure: Material transfers, Dedicated facility (PROC8b)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours

<b>Technical and organisational conditions and measures</b>	
Ensure material transfers are under containment or extract ventilation.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

**4.2.6. Control of worker exposure: General exposures, Use in contained batch processes, With sample collection (PROC3)**

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Ensure material transfers are under containment or extract ventilation.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

**4.2.7. Control of worker exposure: General exposures, Use in contained batch processes, With sample collection (PROC3)**

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	

Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Provide extract ventilation to points where emissions occur.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear a respirator conforming to EN140 with Type A filter or better.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

#### 4.2.8. Control of worker exposure: Use in contained systems (PROC16)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Ensure operation is undertaken outdoors.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

#### 4.2.9. Control of worker exposure: General exposures, Continuous process, (closed systems) (PROC1)

<b>Product (article) characteristics</b>
--

Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
No other specific measures identified.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

#### 4.2.10. Control of worker exposure: Product sampling, (closed systems) (PROC3)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers use up to 60 min
<b>Technical and organisational conditions and measures</b>	
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Ensure operation is undertaken outdoors.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

#### 4.2.11. Control of worker exposure: Product sampling, (closed systems) (PROC3)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP

<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Use a sampling system designed to control exposure	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear a respirator conforming to EN140 with Type A filter or better.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

#### 4.2.12. Control of worker exposure: Equipment cleaning and maintenance, Vessel and container cleaning (PROC8a)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers use up to 60 min
<b>Technical and organisational conditions and measures</b>	
Drain down system prior to equipment break-in or maintenance Ensure that enough fresh air is supplied to dilute and remove dusts, fumes or vapours. Between 5 and 15 air changes per hour are recommended, with a through draught. Ensure operation is undertaken outdoors.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374. Wear a respirator conforming to EN140 with Type A filter or better.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

**4.2.13. Control of worker exposure: Equipment cleaning and maintenance, Vessel and container cleaning (PROC8a)**

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Drain down system prior to equipment break-in or maintenance Ensure that enough fresh air is supplied to dilute and remove dusts, fumes or vapours. Between 5 and 15 air changes per hour are recommended, with a through draught.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

**4.2.14. Control of worker exposure: Equipment cleaning and maintenance, Vessel and container cleaning (PROC8a)**

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Ensure operation is undertaken outdoors.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training.	

Wear a full face respirator conforming to EN140 with Type A filter or better.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

#### 4.2.15. Control of worker exposure: Bulk product storage, (closed systems) (PROC1)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
No other specific measures identified.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

#### 4.2.16. Control of worker exposure: Laboratory activities (PROC15)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Handle in a fume cupboard or under extract ventilation.	
<b>Other conditions affecting workers exposure</b>	

Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

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

#### 4.3.3. Worker exposure: Material transfers, Dedicated facility (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	3,33 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,83
dermal	systemic	long-term	1,37 mg/kg bw/day	0,15
combined routes				0,99
dermal	systemic	short-term	3,33 mg/kg bw/day	0,10

#### 4.3.4. Worker exposure: Material transfers, Dedicated facility (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	0,79 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,20
dermal	systemic	long-term	6,86 mg/kg bw/day	0,77
combined routes				0,97
dermal	systemic	short-term	0,79 mg/kg bw/day	0,02

#### 4.3.5. Worker exposure: Material transfers, Dedicated facility (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	1,19 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,30
dermal	systemic	long-term	1,37 mg/kg bw/day	0,15
combined routes				0,45
dermal	systemic	short-term	1,19 mg/kg bw/day	0,04

**4.3.6. Worker exposure: General exposures, Use in contained batch processes, With sample collection (PROC3)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	3,33 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,83
dermal	systemic	long-term	0,34 mg/kg bw/day	0,04
combined routes				0,87
dermal	systemic	short-term	3,33 mg/kg bw/day	0,10

**4.3.7. Worker exposure: General exposures, Use in contained batch processes, With sample collection (PROC3)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	2,38 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,59
dermal	systemic	long-term	0,34 mg/kg bw/day	0,04
combined routes				0,63
dermal	systemic	short-term	2,38 mg/kg bw/day	0,07

**4.3.8. Worker exposure: Use in contained systems (PROC16)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	2,77 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,69
dermal	systemic	long-term	0,34 mg/kg bw/day	0,04
combined routes				0,73
dermal	systemic	short-term	2,77 mg/kg bw/day	0,08

**4.3.9. Worker exposure: General exposures, Continuous process, (closed systems) (PROC1)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	0,08 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,02
dermal	systemic	long-term	0,34 mg/kg bw/day	0,04
combined routes				0,06

dermal	systemic	short-term	0,08 mg/kg bw/day	
--------	----------	------------	-------------------	--

**4.3.10. Worker exposure: Product sampling, (closed systems) (PROC3)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	3,33 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,83
dermal	systemic	long-term	0,34 mg/kg bw/day	0,04
combined routes				0,87
dermal	systemic	short-term	3,33 mg/kg bw/day	0,10

**4.3.11. Worker exposure: Product sampling, (closed systems) (PROC3)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	2,38 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,59
dermal	systemic	long-term	0,34 mg/kg bw/day	0,04
combined routes				0,63
dermal	systemic	short-term	2,38 mg/kg bw/day	0,07

**4.3.12. Worker exposure: Equipment cleaning and maintenance, Vessel and container cleaning (PROC8a)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	2,22 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,55
dermal	systemic	long-term	2,74 mg/kg bw/day	0,31
combined routes				0,86
dermal	systemic	short-term	2,22 mg/kg bw/day	0,07

**4.3.13. Worker exposure: Equipment cleaning and maintenance, Vessel and container cleaning (PROC8a)**

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	2,38 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,59

dermal	systemic	long-term	2,74 mg/kg bw/day	0,31
combined routes				0,90
dermal	systemic	short-term	2,38 mg/kg bw/day	0,05

#### 4.3.14. Worker exposure: Equipment cleaning and maintenance, Vessel and container cleaning (PROC8a)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	2,77 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,69
dermal	systemic	long-term	1,37 mg/kg bw/day	0,15
combined routes				0,84
dermal	systemic	short-term	2,77 mg/kg bw/day	0,08

#### 4.3.15. Worker exposure: Bulk product storage, (closed systems) (PROC1)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	0,08 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,02
dermal	systemic	long-term	0,34 mg/kg bw/day	0,04
combined routes				0,06
dermal	systemic	short-term	0,08 mg/kg bw/day	

#### 4.3.16. Worker exposure: Laboratory activities (PROC15)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	1,19 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,30
dermal	systemic	long-term	0,34 mg/kg bw/day	0,04
combined routes				0,34
dermal	systemic	short-term	1,19 mg/kg bw/day	0,04

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

Health - Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Environment - Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Further details on scaling and control technologies are provided in SpERC factsheet <http://cefic.org/en/reach-for-industries-libraries.html>.

**ES5: Use in process chemicals****5.1. Title section**

<b>Structured Short Title</b>	: Use at industrial sites
<b>Substance</b>	: Benzene, ethylenated, by-products from EC-No.: 271-802-8

Environment		
<b>CS1</b>	<b>Use of functional fluid at industrial site</b>	ERC7
Worker		
<b>CS2</b>	<b>General measures (skin irritants)</b>	CS135
<b>CS3</b>	<b>Material transfers, Dedicated facility</b>	PROC8b
<b>CS4</b>	<b>Material transfers, Dedicated facility</b>	PROC8b
<b>CS5</b>	<b>Material transfers, Dedicated facility</b>	PROC8b
<b>CS6</b>	<b>Filling of articles/equipment, Material transfers, Dedicated facility</b>	PROC9
<b>CS7</b>	<b>Filling of articles/equipment, Material transfers, Dedicated facility</b>	PROC8b
<b>CS8</b>	<b>Filling of articles/equipment, Material transfers, Dedicated facility</b>	PROC8b
<b>CS9</b>	<b>General exposures (closed systems)</b>	PROC1
<b>CS10</b>	<b>Equipment cleaning and maintenance</b>	PROC8a
<b>CS11</b>	<b>Equipment cleaning and maintenance</b>	PROC8a
<b>CS12</b>	<b>Equipment cleaning and maintenance</b>	PROC8a

**5.2. Conditions of use affecting exposure****5.2.1. Control of environmental exposure: Use of functional fluid at industrial site (ERC7)**

<b>Additional good practice advice. Obligations according to Article 37(4) of REACH do not apply</b>
Site should have a spill plan to ensure that adequate safeguards are in place to minimize the impact of episodic releases.

**5.2.2. Control of worker exposure: General measures (skin irritants) (CS135)**

<b>Product (article) characteristics</b>
--

Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Avoid all skin contact with product, clean up contamination/spills as soon as they occur. Wear gloves (tested to EN374) if hand contamination likely, wash off any skin contamination immediately. Provide basic employee training to prevent / minimise exposures and to report any skin problems that may develop. Avoid direct eye contact with product, also via contamination on hands.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Use suitable eye protection.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

### 5.2.3. Control of worker exposure: Material transfers, Dedicated facility (PROC8b)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers use up to 240 min
<b>Technical and organisational conditions and measures</b>	
Clear transfer lines prior to de-coupling. Ensure operation is undertaken outdoors.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above

ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented

#### 5.2.4. Control of worker exposure: Material transfers, Dedicated facility (PROC8b)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Clear transfer lines prior to de-coupling.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear a respirator conforming to EN140 with Type A filter or better.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

#### 5.2.5. Control of worker exposure: Material transfers, Dedicated facility (PROC8b)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Ensure material transfers are under containment or extract ventilation.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374.	

<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

#### 5.2.6. Control of worker exposure: Filling of articles/equipment, Material transfers, Dedicated facility (PROC9)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers use up to 240 min
<b>Technical and organisational conditions and measures</b>	
Clear transfer lines prior to de-coupling. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Ensure operation is undertaken outdoors.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

#### 5.2.7. Control of worker exposure: Filling of articles/equipment, Material transfers, Dedicated facility (PROC8b)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours

<b>Technical and organisational conditions and measures</b>	
Clear transfer lines prior to de-coupling.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear a respirator conforming to EN140 with Type A filter or better.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

**5.2.8. Control of worker exposure: Filling of articles/equipment, Material transfers, Dedicated facility (PROC8b)**

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Ensure material transfers are under containment or extract ventilation.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

**5.2.9. Control of worker exposure: General exposures (closed systems) (PROC1)**

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP

<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
No other specific measures identified.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

#### 5.2.10. Control of worker exposure: Equipment cleaning and maintenance (PROC8a)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers use up to 60 min
<b>Technical and organisational conditions and measures</b>	
Ensure that enough fresh air is supplied to dilute and remove dusts, fumes or vapours. Between 5 and 15 air changes per hour are recommended, with a through draught. Drain down system prior to equipment break-in or maintenance	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

#### 5.2.11. Control of worker exposure: Equipment cleaning and maintenance (PROC8a)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	

Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Drain down system prior to equipment break-in or maintenance Ensure that enough fresh air is supplied to dilute and remove dusts, fumes or vapours. Between 5 and 15 air changes per hour are recommended, with a through draught.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear suitable gloves tested to EN374. Wear a respirator conforming to EN140 with Type A filter or better.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

#### 5.2.12. Control of worker exposure: Equipment cleaning and maintenance (PROC8a)

<b>Product (article) characteristics</b>	
Covers concentrations up to 100 %	
Physical form of product	: Liquid, vapour pressure < 0.5 kPa at STP
<b>Amount used (or contained in articles), frequency and duration of use/exposure</b>	
Duration	: Covers daily exposures up to 8 hours
<b>Technical and organisational conditions and measures</b>	
Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Ensure operation is undertaken outdoors.	
<b>Conditions and measures related to personal protection, hygiene and health evaluation</b>	
Wear chemically resistant gloves (tested to EN374) in combination with 'basic' employee training. Wear a full face respirator conforming to EN140 with Type A filter or better.	
<b>Other conditions affecting workers exposure</b>	
Temperature	: Operation is carried out at elevated temperature (> 20°C above ambient temperature).
Assumes a good basic standard of occupational hygiene is implemented	

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

#### 5.3.3. Worker exposure: Material transfers, Dedicated facility (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	3,33 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,83
dermal	systemic	long-term	1,37 mg/kg bw/day	0,15
combined routes				0,99
inhalative	systemic	short-term	3,33 mg/m <sup>3</sup>	0,10

#### 5.3.4. Worker exposure: Material transfers, Dedicated facility (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	0,79 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,20
dermal	systemic	long-term	6,86 mg/kg bw/day	0,77
combined routes				0,97
inhalative	systemic	short-term	0,79 mg/m <sup>3</sup>	0,02

#### 5.3.5. Worker exposure: Material transfers, Dedicated facility (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	1,19 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,30
dermal	systemic	long-term	1,37 mg/kg bw/day	0,15
combined routes				0,45
inhalative	systemic	short-term	1,19 mg/m <sup>3</sup>	0,04

#### 5.3.6. Worker exposure: Filling of articles/equipment, Material transfers, Dedicated facility (PROC9)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
----------------	---------------	--------------------	-------------------	-----

inhalative	systemic	long-term	3,33 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,83
dermal	systemic	long-term	1,37 mg/kg bw/day	0,15
combined routes				0,99
inhalative	systemic	short-term	3,33 mg/m <sup>3</sup>	0,10

### 5.3.7. Worker exposure: Filling of articles/equipment, Material transfers, Dedicated facility (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	0,79 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,30
dermal	systemic	long-term	6,86 mg/kg bw/day	0,15
combined routes				0,45
inhalative	systemic	short-term	0,79 mg/m <sup>3</sup>	0,04

### 5.3.8. Worker exposure: Filling of articles/equipment, Material transfers, Dedicated facility (PROC8b)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	1,19 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,30
dermal	systemic	long-term	1,37 mg/kg bw/day	0,15
combined routes				0,45
inhalative	systemic	short-term	1,19 mg/m <sup>3</sup>	0,04

### 5.3.9. Worker exposure: General exposures (closed systems) (PROC1)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	0,08 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,02
dermal	systemic	long-term	0,34 mg/kg bw/day	0,04
combined routes				0,06
inhalative	systemic	short-term	0,08 mg/m <sup>3</sup>	

### 5.3.10. Worker exposure: Equipment cleaning and maintenance (PROC8a)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	2,22 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,55
dermal	systemic	long-term	2,74 mg/kg bw/day	0,31
combined routes				0,86
inhalative	systemic	short-term	2,22 mg/m <sup>3</sup>	0,07

#### 5.3.11. Worker exposure: Equipment cleaning and maintenance (PROC8a)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	2,38 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,59
dermal	systemic	long-term	2,74 mg/kg bw/day	0,31
combined routes				0,90
inhalative	systemic	short-term	2,38 mg/m <sup>3</sup>	0,07

#### 5.3.12. Worker exposure: Equipment cleaning and maintenance (PROC8a)

Exposure route	Health effect	Exposure indicator	Exposure estimate	RCR
inhalative	systemic	long-term	2,77 mg/m <sup>3</sup> (ECETOC TRA worker v2.0)	0,69
dermal	systemic	long-term	1,37 mg/kg bw/day	0,15
combined routes				0,85
inhalative	systemic	short-term	2,77 mg/m <sup>3</sup>	0,08

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

Health - Estimated workplace exposures are not expected to exceed DNELs when the identified risk management measures are adopted. Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Environment - Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Further details on scaling and control technologies are provided in SpERC factsheet <http://cefic.org/en/reach-for-industries-libraries.html>.

In case this version of the eSDS contains significant changes from the previous version, they are listed below. If no significant changes are displayed, then no significant changes occurred.