

## SIBUR-NEFTEKHIM JSC

### SAFETY DATA SHEET

According to Regulations (EC) 1907/2006 (REACH), (EC) 1272/2008 (CLP) & (EU) 2015/830

## ETHYLENE OXIDE

VERSION: 3.0  
UPDATED: 30/01/2020

### SECTION 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY/UNDERTAKING

#### 1.1. Product identifier

|                        |                                 |
|------------------------|---------------------------------|
| Product form:          | Substance                       |
| Substance name:        | Ethylene oxide                  |
| Chemical name:         | 1,2-Epoxyethane                 |
| EC index No.:          | 603-023-00-X                    |
| EC No.:                | 200-849-9                       |
| CAS-No.:               | 75-21-8                         |
| REACH registration No: | 01-2119432402-53-0256           |
| Formula:               | C <sub>2</sub> H <sub>4</sub> O |
| Synonyms:              | Oxirane                         |
| Trade names:           | Ethylene oxide                  |

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

##### 1.2.1. Relevant identified uses

|                               |  |
|-------------------------------|--|
| Use of the substance/mixture: | Manufacture and distribution of the substance<br>Polymer production<br>Use as an intermediate<br>Use as a laboratory reagent |
|-------------------------------|--|

*See Section 16 for a complete list of uses for which an ES is provided as an Annex.*

|  |               |
|--|---------------|
| Most common technical function of substance: | Intermediates |
|--|---------------|

##### 1.2.2. Uses advised against

|                      |   |
|----------------------|---|
| Restrictions on use: | Uses other than those given in section 1.2.1 are not recommended unless an assessment is completed, prior to commencement of that use, which demonstrates that the use will be controlled |
|----------------------|---|

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

##### Only representative

|                    |  |
|--------------------|--|
| Company name:      | Gazprom Marketing and Trading France               |
| Address:           | 68 avenue des Champs-Élysées, 75008, Paris, France |
| Contact Telephone: | +33 1 42 99 73 50                                  |
| Fax:               | +33 1 42 99 73 99                                  |
| Email Address:     | didier.lebout@gazprom-mt.com                       |

##### Manufacturer

|               |  |
|---------------|--|
| Company name: | SIBUR-NEFTEKHIM JSC                                |
| Address:      | Building 390, Eastern Industrial Zone, Dzerzhinsk, |

Nizhniy Novgorod region, 606000, Russian Federation

Contact phone: +7 8313 27-59-09  
Fax: +7 8313 27-59-99  
Email Address: infosnh@snh.sibur.ru  
Emergency Telephone: +7 8313 27-52-98 (office hours only, GMT+3)

#### 1.4. Emergency telephone number

**Emergency phone in the country of delivery** 112 (Please note that emergency numbers may vary depending upon the country of delivery though 112 remains valid as universal number)

### SECTION 2. HAZARDS IDENTIFICATION

#### 2.1. Classification of the substance or mixture

##### Classification according to Regulation (EC) No. 1272/2008 [CLP]

|                              |            |
|------------------------------|------------|
| Flam.Gas1, Chem. Unst. Gas A | H220, H230 |
| Liquefied gas                | H280       |
| Acute Tox.3 (oral)           | H301       |
| Acute Tox.3 (inhalation)     | H331       |
| Skin Corr. 1                 | H314       |
| Eye Dam. 1                   | H318       |
| Repr. 1B                     | H360Fd     |
| Muta. 1B                     | H340       |
| Carc. 1B                     | H350       |
| STOT SE3 (respiratory tract) | H335       |
| STOT SE 3 (nervous system)   | H336       |
| STOT RE 1 (nervous system)   | H372       |

Full text of hazard classes and H-statements : see section 16

#### 2.2. Label elements

##### Labelling according to Regulation (EC) No. 1272/2008 [CLP]

Hazard pictograms (CLP):



GHS02



GHS08



GHS06



GHS04



GHS05

Signal word (CLP):

**Danger**

Hazard statements (CLP):

H220: Extremely flammable gas.  
H230: May react explosively even in the absence of air.  
H280: Contains gas under pressure; may explode if heated.  
H301: Toxic if swallowed.  
H331: Toxic if inhaled.  
H314: Causes severe skin burns and eye damage.  
H360Fd: May damage fertility. Suspected of damaging the unborn child. (Specific effect: fertility and perhaps development).  
H340: May cause genetic defects. (Route of exposure: Inhalation).  
H350: May cause cancer. (Route of exposure: Inhalation).  
H335: May cause respiratory irritation. (Affected organs: respiratory tract. Route of exposure: Inhalation)  
H336: May cause drowsiness or dizziness. (Affected organs: nervous system. Route of exposure: Inhalation)  
H372: Causes damage to organs through prolonged or repeated exposure. (Affected organs: nervous system).

Precautionary statements (CLP):

P202: Do not handle until all safety precautions have been read and understood.  
 P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.  
 P260: Do not breathe dust/fume/ gas/mist/vapours/spray.  
 P280: Wear protective gloves/ protective clothing/eye protection/face protection.  
 P301 + P330 + P331 + P310: IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISON CENTER/doctor  
 P303 + P361 + P353: IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower].  
 P304 + P340: IF INHALED: Remove person to fresh air and keep comfortable for breathing.  
 P305 + P351 + P338 + P310: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.  
 P410 + P403 + P233: Protect from sunlight. Store in a well-ventilated place. Keep container tightly closed.

EUH-statements: Not applicable

**2.3. Other hazards**

Other hazards not contributing to the classification: No other hazards identified.

Assessment PBT / vPvB: According to Annex XIII of Regulation (EC) No.1907/2006 (REACH):  
 - not fulfilling PBT (persistent/bioaccumulative/toxic) criteria;  
 - not fulfilling vPvB (very persistent/very bioaccumulative) criteria.

**SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS**

**3.1. Substances**

| Name           | Product identifier   | %              | Classification Regulation (EC) No 1272/2008 (CLP)                                       |
|----------------|--|----------------|---|
| Ethylene oxide | (CAS-No.) 75-21-8<br>(EC No.) 200-849-9<br>(EC index No.) 603-023-00-X<br>(REACH-no) 01-2119432402-53-0256 | 99.9<br>-100.0 | H220; H230; H280; H301;<br>H331; H314; H318;<br>H360Fd; H340; H350;<br>H335; H336; H372 |

The product does not contain impurities or additives that could affect product's labelling and classification according to Regulation (EC) No 67/548/EEC and Regulation (EC) No 1272/2008 (CLP).

**3.2. Mixtures**

Not applicable

**SECTION 4. FIRST-AID MEASURES**

**4.1. Description of first aid measures**

**Product-specific hazards and other issues**

Ethylene oxide is may be fatal if inhaled or absorbed through skin. It causes irritation to respiratory tract, skin, and eyes. Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite. It is classified as a carcinogenic to humans. Carcinogenic compounds are chronic toxins with long latency periods that can cause damage after repeated or long duration exposures and often do not have

immediate apparent harmful effects. Users can be exposed to these compounds through inhalation, ingestion, and/or dermal absorption. Dermal absorption may cause the same toxic effects as inhalation or ingestion.

Ethylene oxide may cause genetic defects.

Warning: Ethylene oxide is corrosive to moist tissues.

#### **First-aid measures general**

Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures. Take care to self-protect by avoiding becoming contaminated. Use adequate respiratory protection. Refer to Section 8.

Move contaminated patient(s) out of the dangerous area. Take off all contaminated clothing and shoes. Seek medical assistance - show the material safety data sheet or label if possible.

First aid personnel should pay attention to their own safety. If the patient is likely to become unconscious, place and transport in stable sideways position (recovery position). Immediately remove contaminated clothing in the absence of frostbite.

#### **First-aid measures after inhalation**

Keep patient calm, remove to fresh air. If breathing is difficult, give oxygen if possible or assisted ventilation, (do not use mouth to mouth). Immediately administer a corticosteroid from a controlled/metered dose inhaler. Seek immediate medical attention.

#### **First-aid measures after skin contact**

If liquid ethylene oxide is spilled on the skin, allow ethylene oxide to vaporize before washing thoroughly with soap and water.

Liquid ethylene oxide evaporates rapidly and may chill the skin causing frostbite. Do not tear off clothing frozen to the skin but thaw it off with lukewarm or cold water.

In the absence of frostbite, remove all contaminated clothing and wash immediately with soap and plenty of water for at least 15 minutes.

If skin irritation occurs or in all cases of doubt seek medical advice.

#### **First-aid measures after eye contact**

Following contact with expanded liquid from a compressed gas cylinder (-> frostbite) or with aqueous solutions or concentrated vapors:

- immediately wash affected eyes for at least 15 minutes under running water with eyelids held open;
- remove contact lenses, if present and easy to do, continue rinsing.

If eye irritation persists: Get medical advice/attention.

#### **First-aid measures after ingestion**

Under conditions encountered in practice, swallowing of the gas in toxicologically relevant amounts can nearly be excluded.

Following accidental intake of solutions with low concentrations:

Rinse the mouth and spit the fluids out.

If the casualty is conscious have him drink copious amounts of liquids (water).

Following intake of concentrated solutions, have the casualty immediately drink copious amounts of water.

Spontaneous vomiting will probably occur.

During spontaneous or provoked vomiting hold the head of the casualty low with the body in a prone position in order to avoid penetration of the vomit into the airways.

Get medical attention immediately.

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

|                                    |  |
|------------------------------------|--|
| Symptoms/effects after inhalation: | Inhalation may progressively cause mucous membrane and respiratory irritation, headache, vomiting, cyanosis, drowsiness, weakness, incoordination, CNS depression, lachrymation, nasal discharge and salivation, gasping, and labored breathing. Delayed effects may include |
|------------------------------------|--|

nausea, diarrhea, edema of the lungs, paralysis, convulsions and possibly death.

NOTE: Ethylene oxide has a high odor threshold (> 250 ppm) and the sense of smell does not provide adequate protection against its toxic effects.

Symptoms/effects after skin contact:

Skin contact with liquid ethylene oxide can cause a local erythema, edema, and formation of blisters. Response is more severe on damp skin. There may be a latency period of several hours prior to the onset of symptoms. Ethylene oxide may be absorbed by the skin, and sustained contact may produce adverse effects such as headache, dizziness, nausea and vomiting. Ethylene oxide is a skin sensitizer and some individuals may suffer an allergic skin reaction. Skin contact may also cause allergic contact dermatitis in some exposed individuals.

Symptoms/effects after eye contact:

Vapors may cause eye irritation, tearing, redness and swelling of the conjunctiva.

Liquid ethylene oxide is severely irritating and corrosive to the eyes and contact can cause swelling of the conjunctiva and irreversible corneal injury. Contact with liquid ethylene oxide can cause frostbite.

Symptoms/effects after ingestion:

This relatively unlikely route of exposure is expected to cause severe irritation and burns of the mouth and throat, abdominal pain, nausea, vomiting, collapse and coma. Aspiration may occur during swallowing or vomiting, resulting in lung damage.

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

##### Advice to physician

Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote, administer corticosteroid dose aerosol to prevent pulmonary edema.

### SECTION 5. FIRE-FIGHTING MEASURES

#### 5.1. Extinguishing media

Suitable extinguishing media Extinguish with alcohol foam, carbon dioxide, dry chemical or water spray, fog, or foam. Let burn unless leak can be stopped immediately

Unsuitable extinguishing media Do not use direct water jets on the burning product as they could cause a steam explosion and spread of the fire.

Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.

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

Fire hazard: Extremely flammable gas. Flammable over a wide vapor-air concentration range.

Explosion hazard: Vapor forms explosive mixtures with air over a wide range. Liquid is not detonable but the vapor may be readily initiated into explosive decomposition.

Hazardous decomposition products in case of fire: Carbon monoxide and carbon dioxide.

#### 5.3. Advice for firefighters

Firefighting instructions: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Ensure adequate ventilation.

In the case of fire advise fire fighters on the presence of gas cylinders. Heating causes a rise in pressure, risk of bursting and explosion.

|                                 |  |
|---------------------------------|--|
| Protection during firefighting: | Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas.<br>Move container from fire area if you can do so without risk. Fight fire from maximum distance.<br>Only put out fire if the gas flow can be interrupted.<br>Risk of explosion from gas accumulation and backfire.<br>Possibly allow to burn out in controlled manner.<br>Explosion danger by penetration into sewerage.<br>Do not allow runoff to get into the sewage system.<br>Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. |
| Further information:            | Do not approach containers. Cool containers by spraying them with water from a maximum distance. Vapor should be sprayed with water.<br>May polymerize exothermically if heated or contaminated. If the polymerization takes place inside a container, the container may rupture violently.  |

## SECTION 6. ACCIDENTAL RELEASE MEASURE

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

#### 6.1.1. For non-emergency personnel

|                      |  |
|----------------------|--|
| Emergency procedures | Evacuate non-emergency personnel, isolate hazard area and deny entry<br>Alert emergency personnel. |
|----------------------|--|

#### 6.1.2. For emergency responders

|                      |   |
|----------------------|---|
| Emergency procedures | The hazardous area may only be entered once suitable protective measures are implemented. Breathing protection required. Avoid contact with the skin, eyes and clothing. Avoid skin contact with leaking liquid (danger of frostbite!).<br>Wear respiratory protection, eye protection, hand protection and body protection (see SECTION 8. Exposure controls/personal protection).<br>Attempt to stop the gas from escaping.<br>Vapors from liquefied gas are initially heavier than air and spread along ground.<br>Vapors may travel to source of ignition and flash back.<br>Stay upwind. In enclosed spaces, provide adequate ventilation. |
|----------------------|---|

### 6.2. Environmental precautions

Discharge into the environment must be avoided. Severe hazard to waters. Avoid penetration into water, drainage, sewer, or the ground. Inform the responsible authorities about penetration of even small quantities.

Retain and dispose of contaminated wash water.

### 6.3. Methods and material for containment and cleaning up

Use water spray (fog) to reduce vapours or divert vapour cloud drift. Do not use water in a jet. Alcohol foam applied to surface of liquid pools may slow release of EO vapours into the atmosphere.

### 6.4. Reference to other sections

SECTION 8: Exposure controls/personal protection. SECTION 13: Disposal considerations.



## SECTION 7. HANDLING AND STORAGE

### 7.1. Precautions for safe handling

|                               |   |
|-------------------------------|---|
| Precautions for safe handling | <p>Ensure thorough ventilation of stores and work areas. Protect against moisture. Handle under dry inert gas. Protect against heat. Keep away from sources of ignition - No smoking. Refill and handle product only in closed system.</p> <p>Protection against fire and explosion: Prevent electrostatic charge - sources of ignition should be kept well clear - fire extinguishers should be kept handy. Vapours may form explosive mixture with air. Use non-sparking tools.</p> <p>Conditions for safe storage, including any incompatibilities:<br/>Further information on storage conditions: Keep container tightly closed and dry; store in a cool place. Protect against heat.</p> |
| Hygiene measures              | <p>Avoid contact with skin, eyes and clothing. Do not breathe vapor. Smoking, eating and drinking during handling the product should be prohibited.</p> <p>Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.</p>  |

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

|                        |  |
|------------------------|--|
| Storage conditions     | <p>Prevent electrostatic charge - sources of ignition should be kept well clear - fire extinguishers should be kept handy. Vapours may form explosive mixture with air. Containers, even those that have been emptied, can contain explosive vapours. Do not cut, drill, grind, weld or perform similar operations on or near containers. Use non-sparking tools.</p> <p>Keep container tightly closed and dry; store in a cool place.</p> <p>Avoid contamination. Small amounts of polymer may form during extended storage. Do not store mixtures of this product and water to avoid potential for hazardous reaction.</p> |
| Incompatible materials | <p>Avoid contamination with organic bases, strong acids, ammonia, copper, silver, magnesium and their salts, anhydrous chlorides or iron, tin and aluminium, and alkali metal hydroxides.</p> <p>Avoid contact with oxidizing materials. Avoid contact with: Acids. Alkali metal alkoxides. Aluminum chloride. Water. Aluminum oxide. Amines. Bases. Iron chloride. Tin chloride. Organic compounds. Oxygen. Heat produced by the reaction with water will cause vaporization. Some reactions can be violent. Avoid contact with absorbent materials such as: Claybased absorbents.</p>                                      |
| Storage area           | <p>Ensure thorough ventilation of stores and work areas. Protect against moisture.</p> <p>Store under inert atmosphere in rust-free containers or equipment away from heat, spark and flame. Maintain inert atmosphere, even in empty ethylene oxide vessels.</p>  |

Keep away from sources of ignition - No smoking. Refill and handle product only in closed system.

Storage Temperature: 30 °C / 86 °F maximum.

Packaging materials

Store in the following material(s): Stainless steel. Mild steel. Carbon steel

Avoid prolonged storage in pipelines or small metal containers.

**7.3. Specific end use(s)**

Not applicable.

**SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION**

**8.1. Control parameters**

**8.1.1 Occupational Exposure Limits**

*Ethylene oxide (CAS-No.) 75-21-8*

|                       | <b>LTEL TWA<br/>ppm</b> | <b>LTEL TWA<br/>mg/m<sup>3</sup></b> | <b>STEL<br/>ppm</b> | <b>STEL<br/>mg/m<sup>3</sup></b> | <b>Note</b>   |
|-----------------------|-------------------------|--------------------------------------|---------------------|----------------------------------|---|
| <b>European Union</b> | <b>1(1)</b>             | <b>1,8(1)</b>                        |                     |                                  | Bold-type: Indicative Occupational Exposure Limit Values and Limit Values for Occupational Exposure Binding Occupational Exposure Limit Value<br>(1) Substantial contribution to the total body burden via dermal exposure possible |
| Austria               | 1                       | 2                                    | 4                   | 8                                | TRK value (based on technical feasibility)  |
| Belgium               | 1                       | 1,8                                  |                     |                                  |   |
| Denmark               | 1                       | 1,8                                  | 2                   | 3,6                              |   |
| Finland               | 1                       | 1,8                                  |                     |                                  |   |
| France                | 1                       |                                      | 5                   |                                  |   |
| Germany (AGS)         | 1(1)<br>0,1(2)          | 2(1)<br>0,2(2)                       | 2(1)(3)             | 4(1)(3)                          | (1) Workplace exposure concentration corresponding to the proposed tolerable cancer risk.<br>(2) Workplace exposure concentration corresponding to the proposed preliminary acceptable cancer risk.<br>(3) 15 minutes average value |
| Hungary               |                         |                                      |                     | 1,8                              |   |
| Ireland               | 5                       | 10                                   |                     |                                  |   |
| Israel                | 1<br>0,75(1)            | 1,8<br>1,4(1)                        |                     |                                  | (1) women   |
| Latvia                |                         | 1                                    |                     |                                  |   |
| Poland                |                         | 1                                    |                     |                                  |   |
| Spain                 | 1                       | 1,8                                  |                     |                                  |   |



|  |   |  |      |      |                              |
|--|---|--|------|------|------------------------------|
| Sweden   | 1 | 2  | 5(1) | 9(1) | (1) 15 minutes average value |
| Switzerland  | 1 | 2  |      |      |                              |
| The Netherlands  |   | 0,84   |      |      |                              |
| United Kingdom   | 5 | 9,2  |      |      |                              |
| GESTIS International Limit values: ( <a href="https://limitvalue.ifa.dguv.de/">https://limitvalue.ifa.dguv.de/</a> ) |   |  |      |      |                              |
| <b>8.1.2 DNEL/ PNEC values</b>   |   |  |      |      |                              |
| <i>Ethylene oxide (CAS-No.) 75-21-8</i>  |   |  |      |      |                              |
| <b>DNEL/DMEL (Workers)</b>   |   |  |      |      |                              |
| Acute - systemic effects, dermal   |   | High hazard (no threshold derived)   |      |      |                              |
| Acute - systemic effects, inhalation   |   | (DNEL) 10 mg/m <sup>3</sup> neurotoxicity (By inhalation)                          |      |      |                              |
| Acute - local effects, dermal  |   | High hazard (no threshold derived)   |      |      |                              |
| Acute - local effects, inhalation  |   | High hazard (no threshold derived)   |      |      |                              |
| Long-term - systemic effects, dermal   |   | High hazard (no threshold derived)   |      |      |                              |
| Long-term - systemic effects, inhalation   |   | (DMEL) 1.8 mg/m <sup>3</sup> carcinogenicity (By inhalation)                       |      |      |                              |
| Long-term - local effects, dermal  |   | High hazard (no threshold derived)   |      |      |                              |
| Long-term - local effects, inhalation  |   | (DMEL) 1.8 mg/m <sup>3</sup> carcinogenicity                                       |      |      |                              |
| Eyes, local effects  |   | Medium hazard (no threshold derived)   |      |      |                              |
| <b>DNEL/DMEL (General population)</b>  |   |  |      |      |                              |
| Acute - systemic effects, dermal   |   | hazard unknown but no further hazard information necessary as no exposure expected |      |      |                              |
| Acute - systemic effects, inhalation   |   | hazard unknown but no further hazard information necessary as no exposure expected |      |      |                              |
| Acute - systemic effects, oral   |   | hazard unknown but no further hazard information necessary as no exposure expected |      |      |                              |
| Acute - local effects, dermal  |   | hazard unknown but no further hazard information necessary as no exposure expected |      |      |                              |
| Acute - local effects, inhalation  |   | hazard unknown but no further hazard information necessary as no exposure expected |      |      |                              |
| Long-term - systemic effects, dermal   |   | hazard unknown but no further hazard information necessary as no exposure expected |      |      |                              |
| Long-term - systemic effects, inhalation   |   | hazard unknown but no further hazard information necessary as no exposure expected |      |      |                              |
| Long-term - systemic effects, oral   |   | hazard unknown but no further hazard information necessary as no exposure expected |      |      |                              |
| Long-term - local effects, dermal  |   | hazard unknown but no further hazard information necessary as no exposure expected |      |      |                              |
| Long-term - local effects, inhalation  |   | hazard unknown but no further hazard information necessary as no exposure expected |      |      |                              |
| Eyes, local effects  |   | hazard unknown but no further hazard information necessary as no exposure expected |      |      |                              |
| <b>PNEC (water)</b>  |   |  |      |      |                              |
| PNEC aqua (freshwater)   |   | 0.084 mg/L   |      |      |                              |
| PNEC aqua (marine water)   |   | 0.0084 mg/L  |      |      |                              |
| PNEC aqua (intermittent, freshwater)   |   | 0.84 mg/L  |      |      |                              |
| <b>PNEC (Sediment)</b>   |   |  |      |      |                              |
| PNEC sediment (freshwater)   |   | 0.329 mg/kg sediment dw  |      |      |                              |
| PNEC sediment (marine water)   |   | 0.0329 mg/kg sediment dw   |      |      |                              |

|                                 |                                  |
|---------------------------------|----------------------------------|
| <b>PNEC (Soil)</b>              |                                  |
| PNEC soil                       | 0.0165 mg/kg soil dw             |
| <b>PNEC (Oral)</b>              |                                  |
| PNEC oral (secondary poisoning) | no potential for bioaccumulation |
| <b>PNEC (STP)</b>               |                                  |
| PNEC sewage treatment plant     | 13 mg/L                          |
| <b>PNEC (Air)</b>               |                                  |
| PNEC air                        | no hazard identified             |

## 8.2. Exposure controls

### Appropriate engineering controls:

Ventilation: Hood with forced ventilation. Local exhaust to prevent accumulation above the exposure limit. Material should be handled in enclosed vessels and equipment, in which case general (mechanical) room ventilation should be sufficient. Local exhaust ventilation should be used at points where dust, mist, vapors or gases can escape into the room air. Additional ventilation or exhaust may be required to maintain air concentrations below recommended exposure limits.

### Hand protection:

Use chemical resistant gloves classified under Standard EN374: Protective gloves against chemicals and micro-organisms. The gloves must be replaced immediately after direct contact with the liquid ethylene oxide. Use gloves with insulation for thermal protection, when needed. Do not wear rings, watches, or similar apparel because they can entrap material and cause a burn. Examples of preferred glove barrier materials include: Butyl rubber. 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. 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.

### Eye protection:

Use chemical goggles. Chemical goggles should be consistent with EN 166 or equivalent. If exposure causes eye discomfort, use a full-face respirator. Eye wash fountain should be located in immediate work area.

### Skin and body 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. Safety shower should be located in immediate work area. Remove contaminated clothing immediately, wash skin area with soap and water, and launder clothing before reuse or dispose of properly. Items which cannot be decontaminated, such as shoes, belts and watchbands, should be removed and disposed of properly. For high exposures, use only a total encapsulation suit impervious to this material, to avoid entrapment of liquid and vapor underneath garments.

### 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, use an approved respirator. When respiratory protection is required, use an approved positive-pressure self-contained breathing apparatus or positive-pressure airline with auxiliary self-contained air supply. For emergency conditions, use an approved positive-pressure self-contained breathing apparatus. In confined or poorly ventilated areas, use an approved self-contained breathing apparatus or positive pressure air line with auxiliary self-contained air supply.

**Environmental exposure controls:**

Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour. The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits. Exhaust emission systems should be designed in accordance with local conditions; the air should always be moved away from the source of vapour generation and the person working at this point. Eye washes and showers for emergency use.

Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour. The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits. Exhaust emission systems should be designed in accordance with local conditions; the air should always be moved away from the source of vapour generation and the person working at this point. Firewater monitors and deluge systems are recommended. Eye washes and showers for emergency use.

**Other information:**

Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate. Examples of sources of recommended air monitoring methods are given below or contact supplier. Further national methods may be available. National Institute of Occupational Safety and Health (NIOSH), USA: Manual of analytical Methods <http://www.cdc.gov/niosh/nmam/nmammenu.html> Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods <http://www.osha-slc.gov/dts/sltc/methods/toc.html> Health and Safety Executive (HSE), UK: Methods for the Determination of Hazardous Substances <http://www.hsl.gov.uk/search.htm> Berufsgenossenschaftliches Institut für Arbeitssicherheit (BIA), Germany <http://www.hvbg.de/d/bia/pub/grl/grle.htm> L'Institut National de Recherche et de Sécurité, (INRS), France <http://www.inrs.fr/indexnosdoss.html>

For more information please see the relevant exposure scenario in Annex of this SDS.

**SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES**

**9.1. Information on basic physical and chemical properties**

|   |   |
|---|---|
| Physical state at 20 °C and 1013 hPa              | Gaseous   |
| Colour:   | Colourless  |
| Odour:  | Sweetish, ethereal  |
| Melting / freezing point                          | -111.7 °C at 1013 hPa   |
| Boiling point                                     | 10.7 °C at 1013 hPa   |
| Relative density                                  | 0.88 g/cm <sup>3</sup> at 10 °C (liquid density at boiling point)<br>2.9 g/L at 20 °C (gas density) |
| Vapour pressure                                   | 1456 hPa at 20 °C   |
| Surface tension                                   | Not surface active  |
| Water solubility                                  | Miscible in all proportions   |
| Partition coefficient n-octanol/water (log value) | -0.3 at 25 °C   |
| Flash point                                       | Not relevant<br>Regardless of the substance being a gas at room temperature, and the                |

|   |  |
|---|--|
| Flammability  | flash point consequently being of no relevance under REACH, flash points of -57 to -17 °C are reported in the technical literature.<br>Extremely flammable gas.<br>The substance is not pyrophoric, and yields no flammable gases on contact with water. Given the flammability limits in air of 2.6 - 100 vol%, however, the substance is extremely flammable. Aqueous solutions of ethylene oxide are flammable to highly flammable liquids, depending on the concentration. |
| Explosive properties  | Non explosive  |
| Self-ignition temperature   | 429 °C at 1013 hPa   |
| Oxidising properties  | No oxidising properties<br>The Substance is incapable of reacting exothermically with combustible materials on the basis of the chemical structure.  |
| Viscosity   | Not applicable   |
| Granulometry  | Not applicable<br>Substance is marketed or used in a non solid or granular form.   |
| Stability in organic solvents and identity of relevant degradation products | Not applicable<br>The stability of the substance is not considered as critical.  |
| Stability: thermal, sunlight, metals  | Gaseous ethylene oxide may decompose violently when coming in contact with an ignition source.   |
| Dissociation constant   | Not applicable<br>The substance does not contain any ionic structure.  |
| Gases under pressure  | Liquified gas  |

## 9.2. Other information

Not available.

## SECTION 10. STABILITY AND REACTIVITY

### 10.1. Reactivity

No corrosive effect on metal.-

### 10.2. Chemical stability

Stable under recommended storage and handling conditions. Unstable at elevated temperatures.

### 10.3. Possibility of hazardous reactions

Pure EO or EO vapour mixed with air or inert gases can decompose explosively. The violence of the explosion depends on pressure, temperature and concentration; the form and energy of the ignition source, and the type of container. Reacts exothermically with bases (eg caustic soda), ammonia, primary and secondary amines, alcohols, water and acids.

Dangerous polymerisation can occur on contact with highly catalytic surfaces. At high temperatures, for example fire conditions, exothermic polymerisation may occur causing possible container rupture.

### 10.4. Conditions to avoid

Avoid all sources of ignition: heat, flames and sparks. Prevent vapour accumulation.

Avoid temperatures above 450°C (842°F) Prevent heat buildup by avoiding flame or heat impingement on vessels and piping. Exposure to elevated temperatures can cause product to decompose. Avoid static discharge. Avoid open flames, welding arcs, or other high temperature sources which induce thermal decomposition. Do not store mixtures of this product and water to avoid potential for hazardous reaction. Rapid heating of vapor phase ethylene oxide in the presence of ethylene oxide polymer and certain forms of iron oxide has caused at least one significant industrial incident.

### 10.5. Incompatible materials

Avoid contamination with organic bases, strong acids, ammonia, copper, silver, magnesium and their salts, anhydrous chlorides or iron, tin and aluminium, and alkali metal hydroxides.

Avoid contact with oxidizing materials. Avoid contact with: Acids. Alkali metal alkoxides. Aluminum chloride. Water. Aluminum oxide. Amines. Bases. Iron chloride. Tin chloride. Organic compounds. Oxygen. Heat produced by the reaction with water will cause vaporization. Some reactions can be violent. Avoid contact with absorbent materials such as: Claybased absorbents.

### 10.6. Hazardous decomposition products

Thermal decomposition is highly dependent on conditions. A complex mixture of airborne solids, liquids and gases, including carbon monoxide, carbon dioxide and other organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation.

## SECTION 11. TOXICOLOGICAL INFORMATION

### 11.1. Information on toxicological effects

**Acute toxicity** CLP classification (Regulation (EC) No 1272/2008):  
 Inhalation route (vapour): Acute Category 3. Toxic if inhaled.  
 Ingestion: Acute Tox. 3. Toxic if swallowed.

| <i>Ethylene oxide (CAS-No.) 75-21-8</i> |   |
|---|---|
| LD50, oral, guinea pig, male/female     | 270 mg/kg bw (OECD Guideline 401)   |
| LD50, oral, rat, male                   | 330 mg/kg bw (OECD Guideline 401)   |
| LC50, inhalation, mouse, female         | 660 ppm (corr. to 1189 mg/m <sup>3</sup> air) (4h) (OECD Guideline 403)                     |
| LC50, inhalation, rat                   | 2.767 mg/L (4h) (female) (OECD Guideline 403)<br>3.55 mg/L (4h) (male) (OECD Guideline 403) |

**Skin corrosion/irritation** Adverse effect observed (corrosive). CLP classification (Regulation (EC) No 1272/2008): Skin corrosion/irritation: Category 1

**Serious eye damage/irritation** Adverse effect observed (irreversible damage). CLP classification (Regulation (EC) No 1272/2008): Serious eye damage/eye irritation: Category 1

**Respiratory or skin sensitisation** Skin sensitisation : no adverse effect observed (not sensitising). CLP classification (Regulation (EC) No 1272/2008): no classification required.  
 Respiratory sensitisation: No study available.

**Germ cell mutagenicity** Genetic toxicity: adverse effect observed (positive). CLP classification (Regulation (EC) No 1272/2008): mutagen of category 1B, H340 May cause genetic defects. (Route of exposure: Inhalation).

**in vitro studies:** Positive.

Experimental result. Bacterial reverse mutation assay (Ames test, gene mutation) mammalian cell gene mutation assay (gene mutation)

**in vivo studies:** Positive.

Experimental result. Rodent dominant lethal assay (chromosome aberration) rat, mouse /inhalation

**Carcinogenicity** Adverse effect observed. CLP classification (Regulation (EC) No 1272/2008): Carcinogenicity: Carc. Cat. 1B, H350 May cause cancer. (Route of exposure: Inhalation)

| <i>Ethylene oxide (CAS-No.) 75-21-8</i> |   |
|---|---|
| LOAEC, inhalation, rat (male/female)    | 18 mg/m <sup>3</sup> (chronic) (OECD Guideline 453) |



**Toxicity for reproduction**

Adverse effect observed. CLP classification (Regulation (EC) No 1272/2008): Reproductive toxicant category 1B, H360Fd May damage fertility. Suspected of damaging the unborn child. (Specific effect: fertility and perhaps development).

| <i>Ethylene oxide (CAS-No.) 75-21-8</i>                    |   |
|--|---|
| NOAEC (effects on fertility), inhalation, rat, male/female | 54 mg/ m <sup>3</sup> air (subchronic) (OECD Guideline 415) |
| NOAEC (developmental toxicity), inhalation, rat            | 180 mg/ m <sup>3</sup> air (subacute)(OECD Guideline 414)   |
| NOAEC (developmental toxicity), inhalation, NZW rabbit     | 270 mg/ m <sup>3</sup> air                                  |

**STOT-single exposure**

STOT Single Exp. 3. H335: May cause respiratory irritation. Affected organs: Respiratory tract. Route of exposure: Inhalation  
 STOT Single Exp. 3. H336: May cause drowsiness or dizziness. Affected organs: nervous system. Route of exposure: Inhalation

**Repeated dose toxicity**

Adverse effect observed. CLP classification (Regulation (EC) No 1272/2008): Specific Target Organ Toxicity: Repeated Exposure 1. H372: Causes damage to organs through prolonged or repeated exposure. (Affected organs: nervous system).

| <i>Ethylene oxide (CAS-No.) 75-21-8</i>     |   |
|---|---|
| NOAEC chronic, inhalation, rat, male/female | 18 mg/m <sup>3</sup> (OECD Guideline 453) |

**Aspiration hazard**

Not available

**SECTION 12. ECOLOGICAL INFORMATION**

**12.1. Toxicity**

*Ethylene oxide (CAS-No.) 75-21-8*

**Fish (Short-term toxicity)**

LC50 (96h) 84 mg/L (*Pimephales promelas*) (freshwater) (EPA-660/3-75-009)  
 Acutely harmful to fish.

**Fish (Long-term toxicity)**

No relevant information available.

**Aquatic invertebrates (Short-term toxicity)**

LC 50 (48 h) 212 mg/L(*Daphnia magna*) (freshwater) (static) (EPA-660/3-75-009)

**Aquatic invertebrates (Long-term toxicity)**

No relevant information available.

**Algae and aquatic plants**

EC50 (96 h) 240 mg/L (*Pseudokirchneriella subcapitata*) (freshwater) (EPA-660/3-75-009)

**Toxicity to aquatic micro-organisms**

EC10 (180 min) 130 mg/L (*activated sludge, domestic*) (freshwater) (static) (OECD Guideline 209 )



## 12.2. Persistence and degradability

|                               |  |
|-------------------------------|--|
| Abiotic degradation:          | <u>Hydrolysis</u><br>In contact with water ethylene oxide will hydrolyse slowly.<br>At neutral pH values (7.4) and at 25 °C a half-life of ethylene oxide in distilled water of 12.2 days was determined. In natural river water the half-life was 14.9 d and in 3% salt water the half-life was about 9 d.<br>Ethylene oxide hydrolyses to ethylene glycol.<br><u>Phototransformation/ photolysis in air</u><br>Half-life (DT50): 57 days (QSAR data) |
| Biodegradation                | <u>Biodegradation in water</u><br>Readily biodegradable:<br>% Degradation of test substance:<br>107% after 28 d (O <sub>2</sub> consumption) (OECD Guideline 301 C)  |
| Persistence and degradability | Direct photodegradation of ethylene oxide is negligible since the molecule lacks a suitable chromophore for absorbing the low-energy UV radiation in the lower troposphere.<br>After evaporation or exposure to the air, the product will slowly degrade by indirect photochemical processes.<br>Ethylene oxide is readily biodegradable according to OECD criteria.   |

## 12.3. Bioaccumulative potential

|                          |  |
|--------------------------|--|
| Aquatic bioaccumulation: | Regarding the 1-octanol/water partition coefficient, accumulation of the test substance in organisms is not to be expected |
| Secondary poisoning:     | Not available  |

## 12.4. Environmental distribution

|                            |  |
|----------------------------|--|
| Adsorption/desorption soil | Based on calculated log Koc values adsorption of ethylene oxide to the solid soil phase is not expected.<br>Adsorption coefficient:<br>log Koc: 0.51 - 0.67 (QSAR) |
| Volatilization             | Ethylene oxide will slowly evaporate from the water surface into the atmosphere.<br>Henry's Law constant H: 15 Pa m <sup>3</sup> /mol at 25 °C (QSAR)              |
| Environmental distribution | Percent distribution in media:<br>Air (%): 7.75-21.8<br>Water (%): 40.5-92.23<br>Soil (%): 0-37.6<br>Sediment (%): 0-0.08  |

## 12.5. Results of PBT and vPvB assessment

Regarding all available data on biotic and abiotic degradation, bioaccumulation and toxicity it can be stated that the substance does not fulfill the PBT criteria (not PBT) and not the vPvB criteria (not vPvB).

## 12.6. Other adverse effects

Not available.

# SECTION 13. DISPOSAL CONSIDERATIONS

## 13.1. Waste treatment methods

|                                |  |
|--------------------------------|--|
| Waste disposal recommendations | This product, when being disposed of in its unused and uncontaminated state should be treated as a hazardous waste according to EC Directive 91/689/EEC. 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.

Methods for cleaning up or taking up:

Suppress gases/vapours/mists with water spray jet. Dilute with plenty of water. Retain and dispose of contaminated wash water.

Waste treatment methods

Incinerate in suitable incineration plant, observing local authority regulations.

Contaminated packaging:

Uncleaned empties should be disposed of in the same manner as the contents.

Disposal should be in accordance with applicable regional, national, and local laws and regulations.

Local regulations may be more stringent than regional or national requirements and must be complied with.

EPA Hazardous Waste Codes

U115 (Ethylene oxide. Toxic (Non-Acute)Hazardous Waste)

European List of Waste (LoW) code

16 05 04\* gases in pressure containers (including halons) containing dangerous substances.

## SECTION 14. TRANSPORT INFORMATION

### 14.1. Land transport (ADR/ RID)

|                                     |  |
|-------------------------------------|--|
| UN-No.                              | UN 1040  |
| Proper Shipping Name:               | ETHYLENE OXIDE                                   |
| Hazard class:                       | 2.3 (2.1)  |
| Packing group:                      | None   |
| Hazard label:                       | Class 2.3 (Toxic Gas); Class 2.1 (Flammable Gas) |
| Classification Code:                | 2TF  |
| Hazard identification number (HIN): | 263  |
| Tunnel restriction code (ADR)       | B/D  |
| Environmental hazard:               | No   |

### 14.2. Inland waterway transport (ADN)

|                                     |  |
|-------------------------------------|--|
| UN-No.                              | UN 1040  |
| Proper Shipping Name:               | ETHYLENE OXIDE                                   |
| Hazard class:                       | 2.3 (2.1)  |
| Packing group:                      | None   |
| Hazard label:                       | Class 2.3 (Toxic Gas); Class 2.1 (Flammable Gas) |
| Classification Code:                | 2TF  |
| Hazard identification number (HIN): | 263  |
| Environmental hazard:               | No   |

### 14.3. Sea transport (IMDG)

|                       |                |
|-----------------------|----------------|
| UN-No.                | UN 1040        |
| Proper Shipping Name: | ETHYLENE OXIDE |
| Hazard class:         | 2.3 (2.1)      |
| Packing group:        | None           |

Hazard label: Class 2.3 (Toxic Gas); Class 2.1 (Flammable Gas)  
EmS-No. (Fire) FD  
EmS-No.(Spillage) SU  
Marine pollutant: No

#### 14.4. Air transport (IATA/ICAO)

UN-No. UN 1040  
Proper Shipping Name: ETHYLENE OXIDE  
Hazard class: 2.3 (2.1)  
Packing group: None  
Hazard label: Class 2.3 (Toxic Gas); Class 2.1 (Flammable Gas)  
Emergency Action Code 2PE  
Environmental hazard: No  
Cargo Packing 200  
Instructions

#### 14.5. Special precautions for user

Always transport in closed containers. Ensure that persons transporting the product know what to do in the event of an accident or spillage. For information regarding Exposure Controls/Personal Protection see Section 8 of the SDS

#### 14.6. Transport in bulk according to Annex II of Marpol and the IBC Code

Not applicable

### SECTION 15. REGULATORY INFORMATION

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

##### 15.1.1. EU-Regulations

Authorisations and/or restrictions on use (Annex XVII): Listed in Annex XVII. Listed .  
Entry 28: Restriction on supply of substances and mixtures to the general public, if classified as Carc. 1A or 1B. Exemptions: Mineral oil products intended for use in mobile or fixed combustion plants, fuels sold in closed systems (e.g. liquid gas bottles), substances and their exempt uses listed in Appendix 11;  
Entry 29: Restriction on supply of substances and mixtures to the general public, if classified as Muta. 1A or 1B. Exemptions: Mineral oil products intended for use in mobile or fixed combustion plants, fuels sold in closed systems (e.g. liquid gas bottles), substances and their exempt uses listed in Appendix 11;  
Entry 40: Restricted in aerosol dispensers intended for supply to the general public for entertainment and decorative purposes)

*Ethylene oxide (CAS-No.) 75-21-8* is not on the REACH Candidate List.

*Ethylene oxide (CAS-No.) 75-21-8* is not on the REACH Annex XIV List.

Other information, restriction and prohibition regulations Regulation (EC) No. 1005/2009 on substances that deplete the ozone layer, Annex I and Regulation (EC) No. 1005/2009 on substances that deplete the ozone layer. Annex II - Not listed.

Directive 2012/18/EU on the control of major-accident hazards involving dangerous substances- (SEVESO III): Listed. Annex I. Part2 – Categories of dangerous substances. Physical Hazard – P2 - Flammable gases.  
Lower tier requirements qualifying quantity = 5 tonnes; Upper-tier requirements qualifying quantity = 50 tonnes.

Directive 2013/39/EU priority substances in the field of water policy (amending Directive 2006/60/EC – Water Framework Directive and Directive 2008/105/EC on environmental quality standards in the field of water policy): Not listed.

Regulation (EC) No 850/2004 on persistent organic pollutants: Annex III – Not listed.

Regulation (EC) No 649/2012 of the European Parliament and of the Council of 4 July 2012 concerning the export and import of dangerous chemicals:

Ethylene oxide is listed in List of chemicals subject to export notification procedure (CN code: 2910 10 00, Subcategory: p(1), Use limitation: b; Countries for which no ratification is required (PIC circular at [www.pic.int](http://www.pic.int))).

Industrial Emissions Directive 2010/75/EU (IED): Listed , VOC - Annex II (Air polluting substance)

Toy Safety Directive 2009/48/EC ( TSD): Listed. Prohibited CMR under Annex II, part 3, although exemptions may apply when the conditions laid down in Annex II, part 3 are met.

Cosmetic Products Regulation (EC) No. 1223/2009: Listed. Prohibited CMR under Article 15; Banned, Annex II

Prior Informed Consent ( PIC): Listed in Annex I, Parts 1 & 3

E-PRTR Regulation (EC) No. 166/2006: Listed. Yes (Annex II - Threshold for releases (kg/year): 1000 (air); 10 (water); 10 (land))  
Commission Regulation (EU) No. 10/2011 (Plastics in contact with food Regulation): Listed. Yes (Annex I. Use as additive or polymer production aid = no. Use as monomer or other starting substance or macromolecule obtained from microbial fermentation = yes. FRF applicable = no. SML = ND = 0,01 mg/kg. Restrictions and specifications = 1 mg/kg in final product)

Carcinogens or mutagens at work Directive 2004/37/EC: Listed.  
Annex III: LTEL (8 hr) (ppm): 1LTEL (8 hr) (mg/m<sup>3</sup>): 1.8  
Note: Substantial contribution to the total body burden via dermal exposure possible.

### 15.1.2. National regulations

#### Germany

Ordinance on facilities for handling substances that are hazardous to water (Verordnung über Anlagen zum Umgang mit wassergefährdenden Stoffen (AwSV)) of 18 April 2017 (BGBl 2017, Teil I, Nr. 22, Seite 905).

Kennummer: 253

Water hazard class ( WGK 3 - severe hazard to waters)

|                 |   |
|-----------------|---|
|                 | Ordinance on the Protection against Hazardous Substances (GefStoffV): Listed. Annex 1, Number 4<br>Recommendations for Food Contact Materials ( BfR)<br>II. Plasticizer-free polyvinyl chloride, plasticizer-free copolymers of vinyl chloride and mixtures of these polymers with other copolymers and chlorinated polyolefins containing mainly vinyl chloride in the total mixture<br>III. Polyethylene<br>VII. Polypropylene<br>XIV. Polymer Dispersions<br>XXXVI. Paper and Board for Food Contact<br>XXXIX. Commodities Based on Polyurethanes<br>XLI. Linear Polyurethanes for Paper Coatings<br>LI. Temperature Resistant Polymer Coating Systems for Frying, Cooking and Baking Utensils<br>UBA Master List: Listed Group 1: CMR substances Categories 1 and 2 |
| The Netherlands | ZZS plant protection product and/or biocide; ZZS oxirane. Dust class air emissions: MVP2. Boundary mass flow: 2,5 g/hour. Annual mass flow exemption limit: 1,25 kg/year. Emission limit value: 1 mg/Nm <sup>3</sup> .  |
| Norway          | Restrictions. Listed VOC – Chapter 2-25. Volatile organic compounds in paint and varnish products; Chapter 2-30. Substances, preparations and products that are covered by Annex XVII of the REACH Regulation.  |
| Sweden          | KEMI Prio database; Listed. Priority Level: Phase-out substance; Criteria: CMR ( Category 1A and 1B). Carcinogenic; CMR ( category 1A and 1 B), Mutagenic)  |
| Switzerland     | Packaging inks Annex 10. Listed. Part A:evaluated substances. List 1. Specific migration limit=No detectable ( Detection limit=0,01 mg/kg)  |

## 15.2. Chemical safety assessment

Chemical Safety Report has been performed for *Ethylene oxide (CAS-No.) 75-21-8*.

## SECTION 16. OTHER INFORMATION

### 16.1 Indication of changes

| Version     | Date of change | Section     | Description of changes  |
|-------------|----------------|-------------|---|
| Version:2.1 | 02/08/2011     | All         | Issued by HS&E Manager  |
| Version:2.2 | 01/02/2016     | All         | Format of all sections was modified. Classification H230 and H372 was added.  |
| Version:2.3 | 14/06/2017     | 1           | Contact details of the manufacturer and the Only Representative were modified.  |
| Version:3.0 | 30/01/2020     | 1-16, Annex | Contact details of the Only Representative were modified.<br>SDS have been corrected in according to new data of Registration dossier, Chemical Safety Report, and new Transport information. |

|  |  |  |   |
|--|--|--|---|
|  |  |  | Classification H318, H336 and H360Fd was added.<br>Classification H301, H314 and H319 was modified.<br>Labelling GHS05 was added. |
|--|--|--|---|

**16.2 Abbreviations and acronyms**

|                 |   |
|-----------------|---|
| ADR             | European Agreement concerning the International Carriage of Dangerous Goods by Road |
| AGS             | The German Committee on Hazardous Substances (Ausschuss für Gefahrstoffe – AGS)     |
| BCF             | Bioconcentration factor   |
| DFG             | Germany Research Foundation   |
| DNEL            | Derived No Effect Level   |
| IMDG            | International Maritime Dangerous Goods  |
| ICAO-TI         | Technical Instructions for the Safe Transport of Dangerous Goods by Air             |
| K <sub>oc</sub> | Adsorption coefficient  |
| K <sub>ow</sub> | octanol-water partition coefficient   |
| LC50            | Lethal Concentration to 50 % of a test population                                   |
| LD50            | Lethal Dose to 50% of a test population (Median Lethal Dose)                        |
| LOAEC           | Lowest Observable Adverse Effect Concentration                                      |
| LTEL            | Long Term Exposure Limit  |
| NIOSH           | National Institute for Occupational Safety and Health ( <i>USA CDC</i> )            |
| NOEC            | No Observed Effect Concentration  |
| NOAEL           | No Observed Adverse Effect Level  |
| OECD            | Organization for Economic Co-operation and Development                              |
| OSHA            | Occupational Safety & Health Administration ( <i>USA</i> )                          |
| PNEC            | Predicted No Effect Concentration   |
| PBT             | Persistent, bioaccumulative, toxic chemical   |
| vPvB            | Very Persistent, Very Bioaccumulative   |
| RID             | Regulations concerning the International Carriage of Dangerous Goods by Rail        |
| SCOEL           | Scientific Committee on Occupational Exposure Limits                                |
| STEL            | Short Term Exposure Limit   |
| STP             | sewage treatment plant  |
| STOT            | Specific Target Organ Toxicity  |
| (STOT) RE       | Repeated Exposure   |
| (STOT) SE       | Single Exposure   |
| TWA             | Time Weighted Average   |
| UN              | United Nations  |
| WGK             | Wassergefährdungsklasse ( <i>German: Water Hazard Class</i> )                       |

**16.3. Full text of H- and EUH-statements:**

|      |                          |   |
|------|--------------------------|---|
| H220 | Flam.Gas1                | Extremely flammable gas.                            |
| H230 | Unst. Gas A              | May react explosively even in the absence of air.   |
| H280 | Liquefied gas            | Contains gas under pressure; may explode if heated. |
| H301 | Acute Tox.3 (oral)       | Toxic if swallowed.                                 |
| H331 | Acute Tox.3 (inhalation) | Toxic if inhaled.                                   |
| H314 | Skin Corr. 1             | Causes severe skin burns and eye damage.            |



|        |                              |   |
|--------|------------------------------|---|
| H360Fd | Repr. 1B.                    | May damage fertility. Suspected of damaging the unborn child. (Specific effect: fertility and perhaps development). |
| H340   | Muta. 1B                     | May cause genetic defects (Route of exposure: Inhalation).  |
| H350   | Carc. 1B                     | May cause cancer (Route of exposure: Inhalation).   |
| H335   | STOT SE3 (respiratory tract) | May cause respiratory irritation (Affected organs: respiratory tract. Route of exposure: Inhalation).               |
| H336   | STOT SE 3 (nervous system)   | May cause drowsiness or dizziness. (Affected organs: nervous system. Route of exposure: Inhalation).                |
| H372   | STOT RE 1 (nervous system)   | Causes damage to organs through prolonged or repeated exposure (Affected organs: nervous system).                   |

#### 16.4 List of ES (exposure scenario) given in Annex to the extended SDS

|     |  |
|-----|--|
| ES1 | M-1: Manufacture and distribution of the substance |
| ES2 | IW-2: Polymer production                           |
| ES3 | IW-3: Use as an intermediate                       |
| ES4 | PW-4: Use as a laboratory reagent                  |

#### 16.5. Key literature references and sources

##### DOCUMENTS, PROVIDED BY FERC CONSORTIUM:

CHEMICAL SAFETY REPORT to *Ethylene oxide (CAS-No.) 75-21-8*

##### EU DIRECTIVES

REGULATION (EC) No 1907/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC.

Regulation (EC) No 1272/2008 REGULATION (EC) No 1272/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006.

Regulations. Commission regulation (EU) no 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH).

##### Training advice

Personnel handling the product has to be acquainted demonstrably with its hazardous properties, with health and environmental protection principles related to the product and first aid principles.

##### DISCLAIMER

*This information is based on our current level of knowledge. This information may be subject to revision as new knowledge and experience becomes available, and SIBUR makes no warranties and assumes no liability in connection with any use of this information. Since SIBUR cannot be aware of all aspects of your business and the impact the REACH Regulation has for your company, SIBUR strongly encourages you to get familiar with the REACH Regulation in order to comply with its requirements and timelines.*

| ANNEX. EXPOSURE SCENARIOS   |  |
|---|--|
| Exposure Scenario 1 (ES1): M-1: Manufacture and distribution of the substance   |  |
| <b>Free short title</b>   | <b>Manufacture and distribution of the substance</b>   |
| <b>Systematic title based on use descriptor</b>   | ERC 1; PROC 1, 2, 3, 8B, 9, 15   |
| <b>Name of contributing environmental scenario and corresponding ERC</b>  | ERC 1 - Production of chemicals  |
| <b>Name(s) of contributing worker scenarios and corresponding PROCs</b>   | PROC 1 - Use in closed process, no likelihood of exposure<br>PROC 1 - Use in closed process, no likelihood of exposure<br>PROC 2 - Use in closed, continuous process with occasional controlled exposure<br>PROC 2 - Use in closed, continuous process with occasional controlled exposure<br>PROC 3 - Use in closed batch process (synthesis or formulation)<br>PROC 3 - Use in closed batch process (synthesis or formulation)<br>PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities<br>PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities<br>PROC 9 - Transfer of chemicals into small containers (dedicated filling line)<br>PROC 9 - Transfer of chemicals into small containers (dedicated filling line)<br>PROC 15 - Use of laboratory reagents in small scale laboratories<br>PROC 15 - Use of laboratory reagents in small scale laboratories |
| <b>Contributing Scenario (1) controlling environmental exposure for ERC 1</b>   |  |
| As no environmental hazard was identified no environmental-related exposure assessment and risk characterization was performed. |  |
| <b>Contributing Scenario (2) controlling industrial worker exposure for PROC 1</b>  |  |
| <b>Name of contributing scenario</b>  | 1 - Use in closed process, no likelihood of exposure   |
| <b>Exposure type</b>  | Inhalation: Long-term systemic<br>Dermal: Qualitative Risk Assessment  |
| <b>Qualitative Risk Assessment</b>  |  |
| General   | Ensure that gas alarms are installed<br>Ensure that the worker is in a separated (control) room with independent air supply<br>Provide specific employee training to prevent/minimize exposures.<br>Wear suitable face shield<br>Wear safety shoes during all process steps<br>In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.<br>Pumps and sampling stations are additionally isolated with a circumfluent water film.<br>Wear suitable helmets during monitoring.<br>Workers should wear portable gas sensors.   |
| Eyes  | Use suitable eye protection.   |
| Dermal  | Use suitable chemically resistant gloves.<br>Wear suitable coveralls to prevent exposure to the skin.  |
| <b>Product characteristics</b>  |  |
| Physical state  | liquid   |
| Concentration in substance  | 100 %  |
| Fugacity / Dustiness  | high   |
| <b>Frequency and duration of use</b>  |  |

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| Duration of activity   | 120 min/day, duration of activity has been considered linearly ( <i>justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.</i> )  |
| Frequency of use   | 5 days / week   |
| <b>Human factors not influenced by risk management</b>   |   |
| Exposed skin surface   | 240 cm <sup>2</sup>   |
| <b>Other given operational conditions affecting workers exposure</b>   |   |
| Location   | indoors   |
| Domain   | industrial  |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |   |
| Local exhaust ventilation  | no  |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |   |
| Respiratory protection   | no  |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**  |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |   |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |   |
| <b>Contributing Scenario (3) controlling industrial worker exposure for PROC 1</b>   |   |
| Name of contributing scenario  | 1 - Use in closed process, no likelihood of exposure  |
| Exposure type  | Inhalation: Short-term systemic<br>Dermal: Qualitative Risk Assessment  |
| <b>Qualitative Risk Assessment</b>   |   |
| General  | Ensure that gasalarms are installed<br>Ensure that the worker is in a separated (control) room with independent air supply<br>Provide specific employee training to prevent/minimize exposures.<br>Wear suitable face shield<br>Wear safety shoes during all process steps<br>In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.<br>Pumps and sampling stations are additionally isolated with a circumfluent water film.<br>Wear suitable helmets during monitoring.<br>Workers should wear portable gas sensors. |
| Eyes   | Use suitable eye protection.  |
| Dermal   | Use suitable chemically resistant gloves.<br>Wear suitable coveralls to prevent exposure to the skin.   |
| <b>Product characteristics</b>   |   |
| Physical state   | liquid  |
| Concentration in substance   | 100 %   |
| Fugacity / Dustiness   | high  |
| <b>Frequency and duration of use</b>   |   |
| Duration of activity   | 120 min/day, duration of activity has been considered linearly ( <i>justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.</i> )  |
| Frequency of use   | 5 days / week   |

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| <b>Human factors not influenced by risk management</b>   |  |
| Exposed skin surface   | 240 cm <sup>2</sup>  |
| <b>Other given operational conditions affecting workers exposure</b>   |  |
| Location   | indoors  |
| Domain   | industrial   |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |  |
| Local exhaust ventilation  | no   |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |  |
| Respiratory protection   | no   |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**   |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |  |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |  |
| <b>Contributing Scenario (4) controlling industrial worker exposure for PROC 2</b>   |  |
| Name of contributing scenario  | 2 - Use in closed, continuous process with occasional controlled exposure  |
| Exposure type  | Inhalation: Long-term systemic<br>Dermal: Qualitative Risk Assessment  |
| <b>Qualitative Risk Assessment</b>   |  |
| General  | Ensure that gasalarms are installed<br>Ensure that the worker is in a separated (control) room with independent air supply<br>Provide specific employee training to prevent/minimize exposures.<br>Wear suitable face shield<br>Wear safety shoes during all process steps<br>Wear suitable respiratory protection.<br>In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.<br>Pumps and sampling stations are additionally isolated with a circumfluent water film.<br>Samples are taken from the circumfluent water film of the pumps on first indication of potential leakages.<br>Wear suitable helmets during monitoring.<br>Workers should wear portable gas sensors. |
| Eyes   | Use suitable eye protection.   |
| Dermal   | Use suitable chemically resistant gloves.<br>Wear suitable coveralls to prevent exposure to the skin.  |
| <b>Product characteristics</b>   |  |
| Physical state   | liquid   |
| Concentration in substance   | 100 %  |
| Fugacity / Dustiness   | high   |
| <b>Frequency and duration of use</b>   |  |
| Duration of activity   | 120 min/day, duration of activity has been considered linearly ( <i>justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.</i> )   |
| Frequency of use   | 5 days / week  |
| <b>Human factors not influenced by risk management</b>   |  |

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| Exposed skin surface   | 480 cm <sup>2</sup>  |
| <b>Other given operational conditions affecting workers exposure</b>   |  |
| Location   | indoors  |
| Domain   | industrial   |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |  |
| Local exhaust ventilation  | no   |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |  |
| Respiratory protection   | no   |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**   |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |  |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |  |
| <b>Contributing Scenario (5) controlling industrial worker exposure for PROC 2</b>   |  |
| Name of contributing scenario  | 2 - Use in closed, continuous process with occasional controlled exposure  |
| Exposure type  | Inhalation: Short-term systemic<br>Dermal: Qualitative Risk Assessment   |
| <b>Qualitative Risk Assessment</b>   |  |
| General  | Ensure that gasalarms are installed<br>Ensure that the worker is in a separated (control) room with independent air supply<br>Provide specific employee training to prevent/minimize exposures.<br>Wear suitable face shield<br>Wear safety shoes during all process steps<br>Wear suitable respiratory protection.<br>In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.<br>Pumps and sampling stations are additionally isolated with a circumfluent water film.<br>Samples are taken from the circumfluent water film of the pumps on first indication of potential leakages.<br>Wear suitable helmets during monitoring.<br>Workers should wear portable gas sensors. |
| Eyes   | Use suitable eye protection.   |
| Dermal   | Use suitable chemically resistant gloves.<br>Wear suitable coveralls to prevent exposure to the skin.  |
| <b>Product characteristics</b>   |  |
| Physical state   | liquid   |
| Concentration in substance   | 100 %  |
| Fugacity / Dustiness   | high   |
| <b>Frequency and duration of use</b>   |  |
| Duration of activity   | 120 min/day, duration of activity has been considered linearly ( <i>justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.</i> )   |
| Frequency of use   | 5 days / week  |
| <b>Human factors not influenced by risk management</b>   |  |
| Exposed skin surface   | 480 cm <sup>2</sup>  |

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|--|--|
| <b>Other given operational conditions affecting workers exposure</b>   |  |
| Location   | indoors  |
| Domain   | industrial   |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |  |
| Local exhaust ventilation  | no   |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |  |
| Respiratory protection   | no   |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**   |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |  |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |  |
| <b>Contributing Scenario (6) controlling industrial worker exposure for PROC 3</b>   |  |
| Name of contributing scenario  | 3 - Use in closed batch process (synthesis or formulation)   |
| Exposure type  | Inhalation: Long-term systemic<br>Dermal: Qualitative Risk Assessment  |
| <b>Qualitative Risk Assessment</b>   |  |
| General  | Ensure that gasalarms are installed<br>Ensure that the worker is in a separated (control) room with independent air supply<br>Provide specific employee training to prevent/minimize exposures.<br>Wear suitable face shield<br>Wear safety shoes during all process steps<br>Wear suitable respiratory protection.<br>In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.<br>Pumps and sampling stations are additionally isolated with a circumfluent water film.<br>Samples are taken from the circumfluent water film of the pumps on first indication of potential leakages.<br>Wear suitable helmets during monitoring.<br>Workers should wear portable gas sensors. |
| Eyes   | Use suitable eye protection.   |
| Dermal   | Use suitable chemically resistant gloves.<br>Wear suitable coveralls to prevent exposure to the skin.  |
| <b>Product characteristics</b>   |  |
| Physical state   | liquid   |
| Concentration in substance   | 100 %  |
| Fugacity / Dustiness   | high   |
| <b>Frequency and duration of use</b>   |  |
| Duration of activity   | 120 min/day, duration of activity has been considered linearly ( <i>justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.</i> )   |
| Frequency of use   | 5 days / week  |
| <b>Human factors not influenced by risk management</b>   |  |
| Exposed skin surface   | 240 cm <sup>2</sup>  |



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|--|--|
| <b>Other given operational conditions affecting workers exposure</b>   |  |
| Location   | indoors  |
| Domain   | industrial   |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |  |
| Local exhaust ventilation  | no   |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |  |
| Respiratory protection   | no   |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**   |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |  |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |  |
| <b>Contributing Scenario (7) controlling industrial worker exposure for PROC 3</b>   |  |
| Name of contributing scenario  | 3 - Use in closed batch process (synthesis or formulation)   |
| Exposure type  | Inhalation: Short-term systemic<br>Dermal: Qualitative Risk Assessment   |
| <b>Qualitative Risk Assessment</b>   |  |
| General  | Ensure that gasalarms are installed<br>Ensure that the worker is in a separated (control) room with independent air supply<br>Provide specific employee training to prevent/minimize exposures.<br>Wear suitable face shield<br>Wear safety shoes during all process steps<br>Wear suitable respiratory protection.<br>In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.<br>Pumps and sampling stations are additionally isolated with a circumfluent water film.<br>Samples are taken from the circumfluent water film of the pumps on first indication of potential leakages.<br>Wear suitable helmets during monitoring.<br>Workers should wear portable gas sensors. |
| Eyes   | Use suitable eye protection.   |
| Dermal   | Use suitable chemically resistant gloves.<br>Wear suitable coveralls to prevent exposure to the skin.  |
| <b>Product characteristics</b>   |  |
| Physical state   | liquid   |
| Concentration in substance   | 100 %  |
| Fugacity / Dustiness   | high   |
| <b>Frequency and duration of use</b>   |  |
| Duration of activity   | 120 min/day, duration of activity has been considered linearly ( <i>justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.</i> )   |
| Frequency of use   | 5 days / week  |
| <b>Human factors not influenced by risk management</b>   |  |
| Exposed skin surface   | 240 cm <sup>2</sup>  |

| <b>Other given operational conditions affecting workers exposure</b>   |  |
|--|--|
| Location   | indoors  |
| Domain   | industrial   |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |  |
| Local exhaust ventilation  | no   |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |  |
| Respiratory protection   | no   |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**   |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |  |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |  |
| <b>Contributing Scenario (8) controlling industrial worker exposure for PROC 8B</b>  |  |
| <b>Name of contributing scenario</b>   | 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities   |
| Exposure type  | Inhalation: Long-term systemic<br>Dermal: Qualitative Risk Assessment  |
| <b>Qualitative Risk Assessment</b>   |  |
| General  | Ensure that gasalarms are installed<br>Ensure that the worker is in a separated (control) room with independent air supply<br>Provide specific employee training to prevent/minimize exposures.<br>Wear safety shoes during all process steps<br>Wear suitable respiratory protection.<br>Transfer via enclosed lines<br>Ensure material transfers are under containment or extract ventilation<br>In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.<br>Pumps and sampling stations are additionally isolated with a circumfluent water film.<br>Workers should wear portable gas sensors. |
| Eyes   | Use suitable eye protection.   |
| Dermal   | Use suitable chemically resistant gloves.<br>Wear suitable coveralls to prevent exposure to the skin.  |
| <b>Product characteristics</b>   |  |
| Physical state   | liquid   |
| Concentration in substance   | 100 %  |
| Fugacity / Dustiness   | high   |
| <b>Frequency and duration of use</b>   |  |
| Duration of activity   | 15 mins to 1 hour  |
| Frequency of use   | 5 days / week  |
| <b>Human factors not influenced by risk management</b>   |  |
| Exposed skin surface   | 960 cm <sup>2</sup>  |
| <b>Other given operational conditions affecting workers exposure</b>   |  |
| Location   | indoors  |
| Domain   | industrial   |

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| <b>Technical conditions and measures to control dispersion and exposure</b>  |   |
| Local exhaust ventilation  | no  |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |   |
| Respiratory protection   | no  |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**  |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |   |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |   |
| <b>Contributing Scenario (9) controlling industrial worker exposure for PROC 8B</b>  |   |
| <b>Name of contributing scenario</b>   | 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities  |
| Exposure type  | Inhalation: Short-term systemic<br>Dermal: Qualitative Risk Assessment  |
| <b>Qualitative Risk Assessment</b>   |   |
| General  | Ensure that gasalarms are installed<br>Ensure that the worker is in a separated (control) room with independent air supply<br>Provide specific employee training to prevent/minimize exposures.<br>Wear suitable face shield<br>Wear safety shoes during all process steps<br>Wear suitable respiratory protection.<br>Transfer via enclosed lines<br>Ensure material transfers are under containment or extract ventilation<br>In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.<br>Pumps and sampling stations are additionally isolated with a circumfluent water film.<br>Workers should wear portable gas sensors. |
| Dermal   | Use suitable chemically resistant gloves.<br>Wear suitable coveralls to prevent exposure to the skin.   |
| <b>Product characteristics</b>   |   |
| Physical state   | liquid  |
| Concentration in substance   | 100 %   |
| Fugacity / Dustiness   | high  |
| <b>Frequency and duration of use</b>   |   |
| Duration of activity   | 15 mins to 1 hour   |
| Frequency of use   | 5 days / week   |
| <b>Human factors not influenced by risk management</b>   |   |
| Exposed skin surface   | 960 cm <sup>2</sup>   |
| <b>Other given operational conditions affecting workers exposure</b>   |   |
| Location   | indoors   |
| Domain   | industrial  |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |   |
| Local exhaust ventilation  | no  |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |   |

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| Respiratory protection   | no  |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**  |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |   |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |   |
| <b>Contributing Scenario (10) controlling industrial worker exposure for PROC 9</b>  |   |
| <b>Name of contributing scenario</b>   | 9 - Transfer of chemicals into small containers (dedicated filling line)  |
| Exposure type  | Inhalation: Long-term systemic<br>Dermal: Qualitative Risk Assessment   |
| <b>Qualitative Risk Assessment</b>   |   |
| General  | Ensure that gasalarms are installed<br>Ensure that the worker is in a separated (control) room with independent air supply<br>Provide specific employee training to prevent/minimize exposures.<br>Wear suitable face shield<br>Wear safety shoes during all process steps<br>Wear suitable respiratory protection.<br>Transfer via enclosed lines<br>Ensure material transfers are under containment or extract ventilation<br>In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.<br>Pumps and sampling stations are additionally isolated with a circumfluent water film.<br>Workers should wear portable gas sensors. |
| Dermal   | Use suitable chemically resistant gloves.<br>Wear suitable coveralls to prevent exposure to the skin.   |
| <b>Product characteristics</b>   |   |
| Physical state   | liquid  |
| Concentration in substance   | 100 %   |
| Fugacity / Dustiness   | high  |
| <b>Frequency and duration of use</b>   |   |
| Duration of activity   | 15 mins to 1 hour   |
| Frequency of use   | 5 days / week   |
| <b>Human factors not influenced by risk management</b>   |   |
| Exposed skin surface   | 480 cm <sup>2</sup>   |
| <b>Other given operational conditions affecting workers exposure</b>   |   |
| Location   | indoors   |
| Domain   | industrial  |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |   |
| Local exhaust ventilation  | no  |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |   |
| Respiratory protection   | no  |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**  |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization             |   |

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| (e.g. TÜV).  |   |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |   |
| <b>Contributing Scenario (11) controlling industrial worker exposure for PROC 9</b>  |   |
| <b>Name of contributing scenario</b>   | 9 - Transfer of chemicals into small containers (dedicated filling line)  |
| <b>Exposure type</b>   | Inhalation: Short-term systemic<br>Dermal: Qualitative Risk Assessment  |
| <b>Qualitative Risk Assessment</b>   |   |
| General  | Ensure that gasalarms are installed<br>Ensure that the worker is in a separated (control) room with independent air supply<br>Provide specific employee training to prevent/minimize exposures.<br>Wear suitable face shield<br>Wear safety shoes during all process steps<br>Wear suitable respiratory protection.<br>Transfer via enclosed lines<br>Ensure material transfers are under containment or extract ventilation<br>In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.<br>Pumps and sampling stations are additionally isolated with a circumfluent water film.<br>Workers should wear portable gas sensors. |
| Dermal   | Use suitable chemically resistant gloves.<br>Wear suitable coveralls to prevent exposure to the skin.   |
| <b>Product characteristics</b>   |   |
| Physical state   | liquid  |
| Concentration in substance   | 100 %   |
| Fugacity / Dustiness   | high  |
| <b>Frequency and duration of use</b>   |   |
| Duration of activity   | 15 mins to 1 hour   |
| Frequency of use   | 5 days / week   |
| <b>Human factors not influenced by risk management</b>   |   |
| Exposed skin surface   | 480 cm <sup>2</sup>   |
| <b>Other given operational conditions affecting workers exposure</b>   |   |
| Location   | indoors   |
| Domain   | industrial  |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |   |
| Local exhaust ventilation  | no  |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |   |
| Respiratory protection   | no  |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**  |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |   |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |   |
| <b>Contributing Scenario (12) controlling industrial worker exposure for PROC 15</b>   |   |

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| <b>Name of contributing scenario</b>   | 15 - Use of laboratory reagents in small scale laboratories  |
| Exposure type  | Inhalation: Long-term systemic<br>Dermal: Qualitative Risk Assessment  |
| <b>Qualitative Risk Assessment</b>   |  |
| General  | Store substance within a closed system.<br>Provide specific employee training to prevent/minimize exposures.<br>Local exhaust ventilation<br>Wear suitable respiratory protection. |
| Dermal   | Use suitable chemically resistant gloves.  |
| <b>Product characteristics</b>   |  |
| Physical state   | liquid   |
| Concentration in substance   | 100 %  |
| Fugacity / Dustiness   | high   |
| <b>Frequency and duration of use</b>   |  |
| Duration of activity   | 15 mins to 1 hour  |
| Frequency of use   | 5 days / week  |
| <b>Human factors not influenced by risk management</b>                                       |  |
| Exposed skin surface   | 240 cm <sup>2</sup>  |
| <b>Other given operational conditions affecting workers exposure</b>                         |  |
| Location   | indoors  |
| Domain   | industrial   |
| <b>Technical conditions and measures to control dispersion and exposure</b>                  |  |
| Local exhaust ventilation  | no   |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b> |  |
| Respiratory protection   | 97.5 % ( <i>justification: RP 97.5% (full face shield)</i> )   |
| Local Exhaust ventilation  | inhalation: 99 % ( <i>justification: Appropriate local exhaust ventilation: Effectiveness: 99%</i> )   |
| <b>Contributing Scenario (13) controlling industrial worker exposure for PROC 15</b>         |  |
| <b>Name of contributing scenario</b>   | 15 - Use of laboratory reagents in small scale laboratories  |
| Exposure type  | Inhalation: Short-term systemic<br>Dermal: Qualitative Risk Assessment   |
| <b>Qualitative Risk Assessment</b>   |  |
| General  | Store substance within a closed system.<br>Provide specific employee training to prevent/minimize exposures.<br>Local exhaust ventilation<br>Wear suitable respiratory protection. |
| Dermal   | Use suitable chemically resistant gloves.  |
| <b>Product characteristics</b>   |  |
| Physical state   | liquid   |
| Concentration in substance   | 100 %  |
| Fugacity / Dustiness   | high   |
| <b>Frequency and duration of use</b>   |  |
| Duration of activity   | 15 mins to 1 hour  |



|   |   |
|---|---|
| Frequency of use  | 5 days / week   |
| <b>Human factors not influenced by risk management</b>  |   |
| Exposed skin surface  | 240 cm <sup>2</sup>   |
| <b>Other given operational conditions affecting workers exposure</b>  |   |
| Location  | indoors   |
| Domain  | industrial  |
| <b>Technical conditions and measures to control dispersion and exposure</b>   |   |
| Local exhaust ventilation   | no  |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>                                    |   |
| Respiratory protection  | 97.5 % ( <i>justification: RP 97.5% (full face shield)</i> )  |
| Local Exhaust ventilation   | inhalation: 99 % ( <i>justification: Appropriate local exhaust ventilation: Effectiveness: 99%</i> )  |
| <b>Exposure Scenario 2 (ES2): IW-2: Polymer production</b>  |   |
| <b>Free short title</b>   | <b>Polymer production</b>   |
| <b>Systematic title based on use descriptor</b>   | ERC 6C; PROC 1, 2, 3, 8B, 9, 15   |
| <b>Name of contributing environmental scenario and corresponding ERC</b>  | ERC 6C - Production of plastics   |
| <b>Name(s) of contributing worker scenarios and corresponding PROCs</b>   | <p>PROC 1 - Use in closed process, no likelihood of exposure</p> <p>PROC 1 - Use in closed process, no likelihood of exposure</p> <p>PROC 2 - Use in closed, continuous process with occasional controlled exposure</p> <p>PROC 2 - Use in closed, continuous process with occasional controlled exposure</p> <p>PROC 3 - Use in closed batch process (synthesis or formulation)</p> <p>PROC 3 - Use in closed batch process (synthesis or formulation)</p> <p>PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities</p> <p>PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities</p> <p>PROC 9 - Transfer of chemicals into small containers (dedicated filling line)</p> <p>PROC 9 - Transfer of chemicals into small containers (dedicated filling line)</p> <p>PROC 15 - Use of laboratory reagents in small scale laboratories</p> <p>PROC 15 - Use of laboratory reagents in small scale laboratories</p> |
| <b>Contributing Scenario (1) controlling environmental exposure for ERC 6C</b>  |   |
| As no environmental hazard was identified no environmental-related exposure assessment and risk characterization was performed. |   |
| <b>Contributing Scenario (2) controlling industrial worker exposure for PROC 1</b>  |   |
| <b>Name of contributing scenario</b>  | 1 - Use in closed process, no likelihood of exposure  |
| <b>Exposure type</b>  | Inhalation: Long-term systemic<br>Dermal: Qualitative Risk Assessment   |
| <b>Qualitative Risk Assessment</b>  |   |

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| General  | <p>Ensure that gasalarms are installed</p> <p>Ensure that the worker is in a separated (control) room with independent air supply</p> <p>Provide specific employee training to prevent/minimize exposures.</p> <p>Wear suitable face shield</p> <p>Wear safety shoes during all process steps</p> <p>In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.</p> <p>Pumps and sampling stations are additionally isolated with a circumfluent water film.</p> <p>Wear suitable helmets during monitoring.</p> <p>Workers should wear portable gas sensors.</p> |
| Eyes   | Use suitable eye protection.   |
| Dermal   | <p>Use suitable chemically resistant gloves.</p> <p>Wear suitable coveralls to prevent exposure to the skin.</p>   |
| <b>Product characteristics</b>   |  |
| Physical state   | liquid   |
| Concentration in substance   | 100 %  |
| Fugacity / Dustiness   | high   |
| <b>Frequency and duration of use</b>   |  |
| Duration of activity   | 120 min/day, duration of activity has been considered linearly ( <i>justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.</i> )   |
| Frequency of use   | 5 days / week  |
| <b>Human factors not influenced by risk management</b>   |  |
| Exposed skin surface   | 240 cm <sup>2</sup>  |
| <b>Other given operational conditions affecting workers exposure</b>   |  |
| Location   | indoors  |
| Domain   | industrial   |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |  |
| Local exhaust ventilation  | no   |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |  |
| Respiratory protection   | no   |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**   |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |  |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |  |
| <b>Contributing Scenario (3) controlling industrial worker exposure for PROC 1</b>   |  |
| Name of contributing scenario  | 1 - Use in closed process, no likelihood of exposure   |
| Exposure type  | <p>Inhalation: Short-term systemic</p> <p>Dermal: Qualitative Risk Assessment</p>  |
| <b>Qualitative Risk Assessment</b>   |  |

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| General  | <p>Ensure that gasalarms are installed</p> <p>Ensure that the worker is in a separated (control) room with independent air supply</p> <p>Provide specific employee training to prevent/minimize exposures.</p> <p>Wear suitable face shield</p> <p>Wear safety shoes during all process steps</p> <p>In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.</p> <p>Pumps and sampling stations are additionally isolated with a circumfluent water film.</p> <p>Wear suitable helmets during monitoring.</p> <p>Workers should wear portable gas sensors.</p> |
| Eyes   | Use suitable eye protection.   |
| Dermal   | <p>Use suitable chemically resistant gloves.</p> <p>Wear suitable coveralls to prevent exposure to the skin.</p>   |
| <b>Product characteristics</b>   |  |
| Physical state   | liquid   |
| Concentration in substance   | 100 %  |
| Fugacity / Dustiness   | high   |
| <b>Frequency and duration of use</b>   |  |
| Duration of activity   | 120 min/day, duration of activity has been considered linearly ( <i>justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.</i> )   |
| Frequency of use   | 5 days / week  |
| <b>Human factors not influenced by risk management</b>   |  |
| Exposed skin surface   | 240 cm <sup>2</sup>  |
| <b>Other given operational conditions affecting workers exposure</b>   |  |
| Location   | indoors  |
| Domain   | industrial   |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |  |
| Local exhaust ventilation  | no   |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |  |
| Respiratory protection   | no   |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**   |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |  |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |  |
| <b>Contributing Scenario (4) controlling industrial worker exposure for PROC 2</b>   |  |
| Name of contributing scenario  | 2 - Use in closed, continuous process with occasional controlled exposure  |
| Exposure type  | <p>Inhalation: Long-term systemic</p> <p>Dermal: Qualitative Risk Assessment</p>   |
| <b>Qualitative Risk Assessment</b>   |  |

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| General  | <p>Ensure that gasalarms are installed</p> <p>Ensure that the worker is in a separated (control) room with independent air supply</p> <p>Provide specific employee training to prevent/minimize exposures.</p> <p>Wear suitable face shield</p> <p>Wear safety shoes during all process steps</p> <p>Wear suitable respiratory protection.</p> <p>In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.</p> <p>Pumps and sampling stations are additionally isolated with a circumfluent water film.</p> <p>Samples are taken from the circumfluent water film of the pumps on first indication of potential leakages.</p> <p>Wear suitable helmets during monitoring.</p> <p>Workers should wear portable gas sensors.</p> |
| Eyes   | Use suitable eye protection.  |
| Dermal   | <p>Use suitable chemically resistant gloves.</p> <p>Wear suitable coveralls to prevent exposure to the skin.</p>  |
| <b>Product characteristics</b>   |   |
| Physical state   | liquid  |
| Concentration in substance   | 100 %   |
| Fugacity / Dustiness   | high  |
| <b>Frequency and duration of use</b>   |   |
| Duration of activity   | 120 min/day, duration of activity has been considered linearly ( <i>justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.</i> )  |
| Frequency of use   | 5 days / week   |
| <b>Human factors not influenced by risk management</b>   |   |
| Exposed skin surface   | 480 cm <sup>2</sup>   |
| <b>Other given operational conditions affecting workers exposure</b>   |   |
| Location   | indoors   |
| Domain   | industrial  |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |   |
| Local exhaust ventilation  | no  |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |   |
| Respiratory protection   | no  |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**  |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |   |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |   |
| <b>Contributing Scenario (5) controlling industrial worker exposure for PROC 2</b>   |   |
| Name of contributing scenario  | 2 - Use in closed, continuous process with occasional controlled exposure   |
| Exposure type  | <p>Inhalation: Short-term systemic</p> <p>Dermal: Qualitative Risk Assessment</p>   |
| <b>Qualitative Risk Assessment</b>   |   |
| General  | Ensure that gasalarms are installed   |

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|  | <p>Ensure that the worker is in a separated (control) room with independent air supply<br/>         Provide specific employee training to prevent/minimize exposures.<br/>         Wear suitable face shield<br/>         Wear safety shoes during all process steps<br/>         Wear suitable respiratory protection.<br/>         In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.<br/>         Pumps and sampling stations are additionally isolated with a circumfluent water film.<br/>         Samples are taken from the circumfluent water film of the pumps on first indication of potential leakages.<br/>         Wear suitable helmets during monitoring.<br/>         Workers should wear portable gas sensors.</p> |
| Eyes   | Use suitable eye protection.   |
| Dermal   | <p>Use suitable chemically resistant gloves.<br/>         Wear suitable coveralls to prevent exposure to the skin.</p>   |
| <b>Product characteristics</b>   |  |
| Physical state   | liquid   |
| Concentration in substance   | 100 %  |
| Fugacity / Dustiness   | high   |
| <b>Frequency and duration of use</b>   |  |
| Duration of activity   | 120 min/day, duration of activity has been considered linearly ( <i>justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.</i> )   |
| Frequency of use   | 5 days / week  |
| <b>Human factors not influenced by risk management</b>   |  |
| Exposed skin surface   | 480 cm <sup>2</sup>  |
| <b>Other given operational conditions affecting workers exposure</b>   |  |
| Location   | indoors  |
| Domain   | industrial   |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |  |
| Local exhaust ventilation  | no   |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |  |
| Respiratory protection   | no   |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**   |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |  |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |  |
| <b>Contributing Scenario (6) controlling industrial worker exposure for PROC 3</b>   |  |
| Name of contributing scenario  | 3 - Use in closed batch process (synthesis or formulation)   |
| Exposure type  | <p>Inhalation: Long-term systemic<br/>         Dermal: Qualitative Risk Assessment</p>   |
| <b>Qualitative Risk Assessment</b>   |  |
| General  | <p>Ensure that gasalarms are installed<br/>         Ensure that the worker is in a separated (control) room with independent air</p>   |

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|  | <p>supply<br/>         Provide specific employee training to prevent/minimize exposures.<br/>         Wear suitable face shield<br/>         Wear safety shoes during all process steps<br/>         Wear suitable respiratory protection.<br/>         In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.<br/>         Pumps and sampling stations are additionally isolated with a circumfluent water film.<br/>         Samples are taken from the circumfluent water film of the pumps on first indication of potential leakages.<br/>         Wear suitable helmets during monitoring.<br/>         Workers should wear portable gas sensors.</p> |
| Eyes   | Use suitable eye protection.  |
| Dermal   | Use suitable chemically resistant gloves.<br>Wear suitable coveralls to prevent exposure to the skin.   |
| <b>Product characteristics</b>   |   |
| Physical state   | liquid  |
| Concentration in substance   | 100 %   |
| Fugacity / Dustiness   | high  |
| <b>Frequency and duration of use</b>   |   |
| Duration of activity   | 120 min/day, duration of activity has been considered linearly ( <i>justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.</i> )  |
| Frequency of use   | 5 days / week   |
| <b>Human factors not influenced by risk management</b>   |   |
| Exposed skin surface   | 240 cm <sup>2</sup>   |
| <b>Other given operational conditions affecting workers exposure</b>   |   |
| Location   | indoors   |
| Domain   | industrial  |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |   |
| Local exhaust ventilation  | no  |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |   |
| Respiratory protection   | no  |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**  |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |   |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |   |
| <b>Contributing Scenario (7) controlling industrial worker exposure for PROC 3</b>   |   |
| Name of contributing scenario  | 3 - Use in closed batch process (synthesis or formulation)  |
| Exposure type  | Inhalation: Short-term systemic<br>Dermal: Qualitative Risk Assessment  |
| <b>Qualitative Risk Assessment</b>   |   |
| General  | Ensure that gasalarms are installed<br>Ensure that the worker is in a separated (control) room with independent air supply  |



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|  | <p>Provide specific employee training to prevent/minimize exposures.<br/>         Wear suitable face shield<br/>         Wear safety shoes during all process steps<br/>         Wear suitable respiratory protection.<br/>         In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.<br/>         Pumps and sampling stations are additionally isolated with a circumfluent water film.<br/>         Samples are taken from the circumfluent water film of the pumps on first indication of potential leakages.<br/>         Wear suitable helmets during monitoring.<br/>         Workers should wear portable gas sensors.</p> |
| Eyes   | Use suitable eye protection.  |
| Dermal   | <p>Use suitable chemically resistant gloves.<br/>         Wear suitable coveralls to prevent exposure to the skin.</p>  |
| <b>Product characteristics</b>   |   |
| Physical state   | liquid  |
| Concentration in substance   | 100 %   |
| Fugacity / Dustiness   | high  |
| <b>Frequency and duration of use</b>   |   |
| Duration of activity   | 120 min/day, duration of activity has been considered linearly ( <i>justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.</i> )  |
| Frequency of use   | 5 days / week   |
| <b>Human factors not influenced by risk management</b>   |   |
| Exposed skin surface   | 240 cm <sup>2</sup>   |
| <b>Other given operational conditions affecting workers exposure</b>   |   |
| Location   | indoors   |
| Domain   | industrial  |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |   |
| Local exhaust ventilation  | no  |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |   |
| Respiratory protection   | no  |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**  |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |   |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |   |
| <b>Contributing Scenario (8) controlling industrial worker exposure for PROC 8B</b>  |   |
| <b>Name of contributing scenario</b>   | 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities  |
| Exposure type  | <p>Inhalation: Long-term systemic<br/>         Dermal: Qualitative Risk Assessment</p>  |
| <b>Qualitative Risk Assessment</b>   |   |

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| General  | <p>Ensure that gasalarms are installed</p> <p>Ensure that the worker is in a separated (control) room with independent air supply</p> <p>Provide specific employee training to prevent/minimize exposures.</p> <p>Wear safety shoes during all process steps</p> <p>Wear suitable respiratory protection.</p> <p>Transfer via enclosed lines</p> <p>Ensure material transfers are under containment or extract ventilation</p> <p>In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.</p> <p>Pumps and sampling stations are additionally isolated with a circumfluent water film.</p> <p>Workers should wear portable gas sensors.</p> |
| Eyes   | Use suitable eye protection.  |
| Dermal   | <p>Use suitable chemically resistant gloves.</p> <p>Wear suitable coveralls to prevent exposure to the skin.</p>  |
| <b>Product characteristics</b>   |   |
| Physical state   | liquid  |
| Concentration in substance   | 100 %   |
| Fugacity / Dustiness   | high  |
| <b>Frequency and duration of use</b>   |   |
| Duration of activity   | 15 mins to 1 hour   |
| Frequency of use   | 5 days / week   |
| <b>Human factors not influenced by risk management</b>   |   |
| Exposed skin surface   | 960 cm <sup>2</sup>   |
| <b>Other given operational conditions affecting workers exposure</b>   |   |
| Location   | indoors   |
| Domain   | industrial  |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |   |
| Local exhaust ventilation  | no  |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |   |
| Respiratory protection   | no  |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**  |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |   |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |   |
| <b>Contributing Scenario (9) controlling industrial worker exposure for PROC 8B</b>  |   |
| Name of contributing scenario  | 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities  |
| Exposure type  | <p>Inhalation: Short-term systemic</p> <p>Dermal: Qualitative Risk Assessment</p>   |
| <b>Qualitative Risk Assessment</b>   |   |

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| General  | <p>Ensure that gasalarms are installed<br/>         Ensure that the worker is in a separated (control) room with independent air supply<br/>         Provide specific employee training to prevent/minimize exposures.<br/>         Wear suitable face shield<br/>         Wear safety shoes during all process steps<br/>         Wear suitable respiratory protection.<br/>         Transfer via enclosed lines<br/>         Ensure material transfers are under containment or extract ventilation<br/>         In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.<br/>         Pumps and sampling stations are additionally isolated with a circumfluent water film.<br/>         Workers should wear portable gas sensors.</p> |
| Dermal   | <p>Use suitable chemically resistant gloves.<br/>         Wear suitable coveralls to prevent exposure to the skin.</p>   |
| <b>Product characteristics</b>   |  |
| Physical state   | liquid   |
| Concentration in substance   | 100 %  |
| Fugacity / Dustiness   | high   |
| <b>Frequency and duration of use</b>   |  |
| Duration of activity   | 15 mins to 1 hour  |
| Frequency of use   | 5 days / week  |
| <b>Human factors not influenced by risk management</b>   |  |
| Exposed skin surface   | 960 cm <sup>2</sup>  |
| <b>Other given operational conditions affecting workers exposure</b>   |  |
| Location   | indoors  |
| Domain   | industrial   |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |  |
| Local exhaust ventilation  | no   |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |  |
| Respiratory protection   | no   |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**   |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |  |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |  |
| <b>Contributing Scenario (10) controlling industrial worker exposure for PROC 9</b>  |  |
| Name of contributing scenario  | 9 - Transfer of chemicals into small containers (dedicated filling line)   |
| Exposure type  | Inhalation: Long-term systemic<br>Dermal: Qualitative Risk Assessment  |
| <b>Qualitative Risk Assessment</b>   |  |

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| General  | <p>Ensure that gasalarms are installed<br/>         Ensure that the worker is in a separated (control) room with independent air supply<br/>         Provide specific employee training to prevent/minimize exposures.<br/>         Wear suitable face shield<br/>         Wear safety shoes during all process steps<br/>         Wear suitable respiratory protection.<br/>         Transfer via enclosed lines<br/>         Ensure material transfers are under containment or extract ventilation<br/>         In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.<br/>         Pumps and sampling stations are additionally isolated with a circumfluent water film.<br/>         Workers should wear portable gas sensors.</p> |
| Dermal   | <p>Use suitable chemically resistant gloves.<br/>         Wear suitable coveralls to prevent exposure to the skin.</p>   |
| <b>Product characteristics</b>   |  |
| Physical state   | liquid   |
| Concentration in substance   | 100 %  |
| Fugacity / Dustiness   | high   |
| <b>Frequency and duration of use</b>   |  |
| Duration of activity   | 15 mins to 1 hour  |
| Frequency of use   | 5 days / week  |
| <b>Human factors not influenced by risk management</b>   |  |
| Exposed skin surface   | 480 cm <sup>2</sup>  |
| <b>Other given operational conditions affecting workers exposure</b>   |  |
| Location   | indoors  |
| Domain   | industrial   |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |  |
| Local exhaust ventilation  | no   |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |  |
| Respiratory protection   | no   |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**   |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |  |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |  |
| <b>Contributing Scenario (11) controlling industrial worker exposure for PROC 9</b>  |  |
| Name of contributing scenario  | 9 - Transfer of chemicals into small containers (dedicated filling line)   |
| Exposure type  | Inhalation: Short-term systemic<br>Dermal: Qualitative Risk Assessment   |
| <b>Qualitative Risk Assessment</b>   |  |

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| General  | <p>Ensure that gasalarms are installed<br/>         Ensure that the worker is in a separated (control) room with independent air supply<br/>         Provide specific employee training to prevent/minimize exposures.<br/>         Wear suitable face shield<br/>         Wear safety shoes during all process steps<br/>         Wear suitable respiratory protection.<br/>         Transfer via enclosed lines<br/>         Ensure material transfers are under containment or extract ventilation<br/>         In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.<br/>         Pumps and sampling stations are additionally isolated with a circumfluent water film.<br/>         Workers should wear portable gas sensors.</p> |
| Dermal   | <p>Use suitable chemically resistant gloves.<br/>         Wear suitable coveralls to prevent exposure to the skin.</p>   |
| <b>Product characteristics</b>   |  |
| Physical state   | liquid   |
| Concentration in substance   | 100 %  |
| Fugacity / Dustiness   | high   |
| <b>Frequency and duration of use</b>   |  |
| Duration of activity   | 15 mins to 1 hour  |
| Frequency of use   | 5 days / week  |
| <b>Human factors not influenced by risk management</b>   |  |
| Exposed skin surface   | 480 cm <sup>2</sup>  |
| <b>Other given operational conditions affecting workers exposure</b>   |  |
| Location   | indoors  |
| Domain   | industrial   |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |  |
| Local exhaust ventilation  | no   |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |  |
| Respiratory protection   | no   |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**   |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |  |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |  |
| <b>Contributing Scenario (12) controlling industrial worker exposure for PROC 15</b>   |  |
| Name of contributing scenario  | 15 - Use of laboratory reagents in small scale laboratories  |
| Exposure type  | Inhalation: Long-term systemic<br>Dermal: Qualitative Risk Assessment  |
| <b>Qualitative Risk Assessment</b>   |  |
| General  | <p>Store substance within a closed system.<br/>         Provide specific employee training to prevent/minimize exposures.<br/>         Local exhaust ventilation<br/>         Wear suitable respiratory protection.</p>  |
| Dermal   | Use suitable chemically resistant gloves.  |

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| <b>Product characteristics</b>   |  |
| Physical state   | liquid   |
| Concentration in substance   | 100 %  |
| Fugacity / Dustiness   | high   |
| <b>Frequency and duration of use</b>   |  |
| Duration of activity   | 15 mins to 1 hour  |
| Frequency of use   | 5 days / week  |
| <b>Human factors not influenced by risk management</b>                                       |  |
| Exposed skin surface   | 240 cm <sup>2</sup>  |
| <b>Other given operational conditions affecting workers exposure</b>                         |  |
| Location   | indoors  |
| Domain   | industrial   |
| <b>Technical conditions and measures to control dispersion and exposure</b>                  |  |
| Local exhaust ventilation  | no   |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b> |  |
| Respiratory protection   | 97.5 % ( <i>justification: RP 97.5% (full face shield)</i> )   |
| Local Exhaust ventilation  | inhalation: 99 % ( <i>justification: Appropriate local exhaust ventilation: Effectiveness: 99%</i> )   |
| <b>Contributing Scenario (13) controlling industrial worker exposure for PROC 15</b>         |  |
| <b>Name of contributing scenario</b>   | 15 - Use of laboratory reagents in small scale laboratories  |
| <b>Exposure type</b>   | Inhalation: Short-term systemic<br>Dermal: Qualitative Risk Assessment   |
| <b>Qualitative Risk Assessment</b>   |  |
| General  | Store substance within a closed system.<br>Provide specific employee training to prevent/minimize exposures.<br>Local exhaust ventilation<br>Wear suitable respiratory protection. |
| Dermal   | Use suitable chemically resistant gloves.  |
| <b>Product characteristics</b>   |  |
| Physical state   | liquid   |
| Concentration in substance   | 100 %  |
| Fugacity / Dustiness   | high   |
| <b>Frequency and duration of use</b>   |  |
| Duration of activity   | 15 mins to 1 hour  |
| Frequency of use   | 5 days / week  |
| <b>Human factors not influenced by risk management</b>                                       |  |
| Exposed skin surface   | 240 cm <sup>2</sup>  |
| <b>Other given operational conditions affecting workers exposure</b>                         |  |
| Location   | indoors  |
| Domain   | industrial   |
| <b>Technical conditions and measures to control dispersion and exposure</b>                  |  |



|   |   |
|---|---|
| Local exhaust ventilation   | no  |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>                                    |   |
| Respiratory protection  | 97.5 % ( <i>justification: RP 97.5% (full face shield)</i> )  |
| Local Exhaust ventilation   | inhalation: 99 % ( <i>justification: Appropriate local exhaust ventilation: Effectiveness: 99%</i> )  |
| <b>Exposure Scenario 3 (ES3): IW-3: Use as an intermediate</b>  |   |
| <b>Free short title</b>   | <b>Use as an intermediate</b>   |
| <b>Systematic title based on use descriptor</b>   | ERC 6A; PROC 1, 2, 3, 8B, 9, 15   |
| <b>Name of contributing environmental scenario and corresponding ERC</b>  | ERC 6A - Industrial use of intermediates  |
| <b>Name(s) of contributing worker scenarios and corresponding PROCs</b>   | <p>PROC 1 - Use in closed process, no likelihood of exposure</p> <p>PROC 1 - Use in closed process, no likelihood of exposure</p> <p>PROC 2 - Use in closed, continuous process with occasional controlled exposure</p> <p>PROC 2 - Use in closed, continuous process with occasional controlled exposure</p> <p>PROC 3 - Use in closed batch process (synthesis or formulation)</p> <p>PROC 3 - Use in closed batch process (synthesis or formulation)</p> <p>PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities</p> <p>PROC 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities</p> <p>PROC 9 - Transfer of chemicals into small containers (dedicated filling line)</p> <p>PROC 9 - Transfer of chemicals into small containers (dedicated filling line)</p> <p>PROC 15 - Use of laboratory reagents in small scale laboratories</p> <p>PROC 15 - Use of laboratory reagents in small scale laboratories</p> |
| <b>Contributing Scenario (1) controlling environmental exposure for ERC 6A</b>  |   |
| As no environmental hazard was identified no environmental-related exposure assessment and risk characterization was performed. |   |
| <b>Contributing Scenario (2) controlling industrial worker exposure for PROC 1</b>  |   |
| <b>Name of contributing scenario</b>  | 1 - Use in closed process, no likelihood of exposure  |
| <b>Exposure type</b>  | Inhalation: Long-term systemic<br>Dermal: Qualitative Risk Assessment   |
| <b>Qualitative Risk Assessment</b>  |   |
| General   | <p>Ensure that gasalarms are installed</p> <p>Ensure that the worker is in a separated (control) room with independent air supply</p> <p>Provide specific employee training to prevent/minimize exposures.</p> <p>Wear suitable face shield</p> <p>Wear safety shoes during all process steps</p> <p>In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.</p> <p>Pumps and sampling stations are additionally isolated with a circumfluent water film.</p> <p>Wear suitable helmets during monitoring.</p> <p>Workers should wear portable gas sensors.</p>  |
| Eyes  | Use suitable eye protection.  |
| Dermal  | Use suitable chemically resistant gloves.<br>Wear suitable coveralls to prevent exposure to the skin.   |
| <b>Product characteristics</b>  |   |
| Physical state  | liquid  |

|  |   |
|--|---|
| Concentration in substance   | 100 %   |
| Fugacity / Dustiness   | high  |
| <b>Frequency and duration of use</b>   |   |
| Duration of activity   | 120 min/day, duration of activity has been considered linearly ( <i>justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.</i> )  |
| Frequency of use   | 5 days / week   |
| <b>Human factors not influenced by risk management</b>   |   |
| Exposed skin surface   | 240 cm <sup>2</sup>   |
| <b>Other given operational conditions affecting workers exposure</b>   |   |
| Location   | indoors   |
| Domain   | industrial  |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |   |
| Local exhaust ventilation  | no  |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |   |
| Respiratory protection   | no  |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**  |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |   |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |   |
| <b>Contributing Scenario (3) controlling industrial worker exposure for PROC 1</b>   |   |
| Name of contributing scenario  | 1 - Use in closed process, no likelihood of exposure  |
| Exposure type  | Inhalation: Short-term systemic<br>Dermal: Qualitative Risk Assessment  |
| <b>Qualitative Risk Assessment</b>   |   |
| General  | Ensure that gasalarms are installed<br>Ensure that the worker is in a separated (control) room with independent air supply<br>Provide specific employee training to prevent/minimize exposures.<br>Wear suitable face shield<br>Wear safety shoes during all process steps<br>In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.<br>Pumps and sampling stations are additionally isolated with a circumfluent water film.<br>Wear suitable helmets during monitoring.<br>Workers should wear portable gas sensors. |
| Eyes   | Use suitable eye protection.  |
| Dermal   | Use suitable chemically resistant gloves.<br>Wear suitable coveralls to prevent exposure to the skin.   |
| <b>Product characteristics</b>   |   |
| Physical state   | liquid  |
| Concentration in substance   | 100 %   |
| Fugacity / Dustiness   | high  |
| <b>Frequency and duration of use</b>   |   |

|  |  |
|--|--|
| Duration of activity   | 120 min/day, duration of activity has been considered linearly ( <i>justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.</i> )   |
| Frequency of use   | 5 days / week  |
| <b>Human factors not influenced by risk management</b>   |  |
| Exposed skin surface   | 240 cm <sup>2</sup>  |
| <b>Other given operational conditions affecting workers exposure</b>   |  |
| Location   | indoors  |
| Domain   | industrial   |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |  |
| Local exhaust ventilation  | no   |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |  |
| Respiratory protection   | no   |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**   |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |  |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |  |
| <b>Contributing Scenario (4) controlling industrial worker exposure for PROC 2</b>   |  |
| Name of contributing scenario  | 2 - Use in closed, continuous process with occasional controlled exposure  |
| Exposure type  | Inhalation: Long-term systemic<br>Dermal: Qualitative Risk Assessment  |
| <b>Qualitative Risk Assessment</b>   |  |
| General  | Ensure that gasalarms are installed<br>Ensure that the worker is in a separated (control) room with independent air supply<br>Provide specific employee training to prevent/minimize exposures.<br>Wear suitable face shield<br>Wear safety shoes during all process steps<br>Wear suitable respiratory protection.<br>In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.<br>Pumps and sampling stations are additionally isolated with a circumfluent water film.<br>Samples are taken from the circumfluent water film of the pumps on first indication of potential leakages.<br>Wear suitable helmets during monitoring.<br>Workers should wear portable gas sensors. |
| Eyes   | Use suitable eye protection.   |
| Dermal   | Use suitable chemically resistant gloves.<br>Wear suitable coveralls to prevent exposure to the skin.  |
| <b>Product characteristics</b>   |  |
| Physical state   | liquid   |
| Concentration in substance   | 100 %  |
| Fugacity / Dustiness   | high   |
| <b>Frequency and duration of use</b>   |  |

|  |  |
|--|--|
| Duration of activity   | 120 min/day, duration of activity has been considered linearly ( <i>justification: Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.</i> )   |
| Frequency of use   | 5 days / week  |
| <b>Human factors not influenced by risk management</b>   |  |
| Exposed skin surface   | 480 cm <sup>2</sup>  |
| <b>Other given operational conditions affecting workers exposure</b>   |  |
| Location   | indoors  |
| Domain   | industrial   |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |  |
| Local exhaust ventilation  | no   |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |  |
| Respiratory protection   | no   |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**   |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |  |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |  |
| <b>Contributing Scenario (5) controlling industrial worker exposure for PROC 2</b>   |  |
| Name of contributing scenario  | 2 - Use in closed, continuous process with occasional controlled exposure  |
| Exposure type  | Inhalation: Short-term systemic<br>Dermal: Qualitative Risk Assessment   |
| <b>Qualitative Risk Assessment</b>   |  |
| General  | Ensure that gasalarms are installed<br>Ensure that the worker is in a separated (control) room with independent air supply<br>Provide specific employee training to prevent/minimize exposures.<br>Wear suitable face shield<br>Wear safety shoes during all process steps<br>Wear suitable respiratory protection.<br>In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.<br>Pumps and sampling stations are additionally isolated with a circumfluent water film.<br>Samples are taken from the circumfluent water film of the pumps on first indication of potential leakages.<br>Wear suitable helmets during monitoring.<br>Workers should wear portable gas sensors. |
| Eyes   | Use suitable eye protection.   |
| Dermal   | Use suitable chemically resistant gloves.<br>Wear suitable coveralls to prevent exposure to the skin.  |
| <b>Product characteristics</b>   |  |
| Physical state   | liquid   |
| Concentration in substance   | 100 %  |
| Fugacity / Dustiness   | high   |
| <b>Frequency and duration of use</b>   |  |
| Duration of activity   | 120 min/day, duration of activity has been considered linearly ( <i>justification:</i>   |

|  |   |
|--|---|
|  | <i>Short monitoring tours and sampling processes which take no longer than 5-10 minutes and never exceed a total of 2 hours per day.)</i>   |
| Frequency of use   | 5 days / week   |
| <b>Human factors not influenced by risk management</b>   |   |
| Exposed skin surface   | 480 cm <sup>2</sup>   |
| <b>Other given operational conditions affecting workers exposure</b>   |   |
| Location   | indoors   |
| Domain   | industrial  |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |   |
| Local exhaust ventilation  | no  |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |   |
| Respiratory protection   | no  |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**  |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |   |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |   |
| <b>Contributing Scenario (6) controlling industrial worker exposure for PROC 3</b>   |   |
| Name of contributing scenario  | 3 - Use in closed batch process (synthesis or formulation)  |
| Exposure type  | Inhalation: Long-term systemic<br>Dermal: Qualitative Risk Assessment   |
| <b>Qualitative Risk Assessment</b>   |   |
| General  | <p>Ensure that gasalarms are installed</p> <p>Ensure that the worker is in a separated (control) room with independent air supply</p> <p>Provide specific employee training to prevent/minimize exposures.</p> <p>Wear suitable face shield</p> <p>Wear safety shoes during all process steps</p> <p>Wear suitable respiratory protection.</p> <p>In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.</p> <p>Pumps and sampling stations are additionally isolated with a circumfluent water film.</p> <p>Samples are taken from the circumfluent water film of the pumps on first indication of potential leakages.</p> <p>Wear suitable helmets during monitoring.</p> <p>Workers should wear portable gas sensors.</p> |
| Eyes   | Use suitable eye protection.  |
| Dermal   | Use suitable chemically resistant gloves.<br>Wear suitable coveralls to prevent exposure to the skin.   |
| <b>Product characteristics</b>   |   |
| Physical state   | liquid  |
| Concentration in substance   | 100 %   |
| Fugacity / Dustiness   | high  |
| <b>Frequency and duration of use</b>   |   |
| Duration of activity   | 120 min/day, duration of activity has been considered linearly ( <i>justification: Short monitoring tours and sampling processes which take no longer than 5-</i>   |

|  |  |
|--|--|
|  | 10 minutes and never exceed a total of 2 hours per day.)   |
| Frequency of use   | 5 days / week  |
| <b>Human factors not influenced by risk management</b>   |  |
| Exposed skin surface   | 240 cm <sup>2</sup>  |
| <b>Other given operational conditions affecting workers exposure</b>   |  |
| Location   | indoors  |
| Domain   | industrial   |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |  |
| Local exhaust ventilation  | no   |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |  |
| Respiratory protection   | no   |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**   |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |  |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |  |
| <b>Contributing Scenario (7) controlling industrial worker exposure for PROC 3</b>   |  |
| Name of contributing scenario  | 3 - Use in closed batch process (synthesis or formulation)   |
| Exposure type  | Inhalation: Short-term systemic<br>Dermal: Qualitative Risk Assessment   |
| <b>Qualitative Risk Assessment</b>   |  |
| General  | Ensure that gasalarms are installed<br>Ensure that the worker is in a separated (control) room with independent air supply<br>Provide specific employee training to prevent/minimize exposures.<br>Wear suitable face shield<br>Wear safety shoes during all process steps<br>Wear suitable respiratory protection.<br>In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.<br>Pumps and sampling stations are additionally isolated with a circumfluent water film.<br>Samples are taken from the circumfluent water film of the pumps on first indication of potential leakages.<br>Wear suitable helmets during monitoring.<br>Workers should wear portable gas sensors. |
| Eyes   | Use suitable eye protection.   |
| Dermal   | Use suitable chemically resistant gloves.<br>Wear suitable coveralls to prevent exposure to the skin.  |
| <b>Product characteristics</b>   |  |
| Physical state   | liquid   |
| Concentration in substance   | 100 %  |
| Fugacity / Dustiness   | high   |
| <b>Frequency and duration of use</b>   |  |
| Duration of activity   | 120 min/day, duration of activity has been considered linearly (justification: Short monitoring tours and sampling processes which take no longer than 5-  |

|  |  |
|--|--|
|  | 10 minutes and never exceed a total of 2 hours per day.)   |
| Frequency of use   | 5 days / week  |
| <b>Human factors not influenced by risk management</b>   |  |
| Exposed skin surface   | 240 cm <sup>2</sup>  |
| <b>Other given operational conditions affecting workers exposure</b>   |  |
| Location   | indoors  |
| Domain   | industrial   |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |  |
| Local exhaust ventilation  | no   |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |  |
| Respiratory protection   | no   |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**   |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |  |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |  |
| <b>Contributing Scenario (8) controlling industrial worker exposure for PROC 8B</b>  |  |
| Name of contributing scenario  | 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities   |
| Exposure type  | Inhalation: Long-term systemic<br>Dermal: Qualitative Risk Assessment  |
| <b>Qualitative Risk Assessment</b>   |  |
| General  | Ensure that gasalarms are installed<br>Ensure that the worker is in a separated (control) room with independent air supply<br>Provide specific employee training to prevent/minimize exposures.<br>Wear safety shoes during all process steps<br>Wear suitable respiratory protection.<br>Transfer via enclosed lines<br>Ensure material transfers are under containment or extract ventilation<br>In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.<br>Pumps and sampling stations are additionally isolated with a circumfluent water film.<br>Workers should wear portable gas sensors. |
| Eyes   | Use suitable eye protection.   |
| Dermal   | Use suitable chemically resistant gloves.<br>Wear suitable coveralls to prevent exposure to the skin.  |
| <b>Product characteristics</b>   |  |
| Physical state   | liquid   |
| Concentration in substance   | 100 %  |
| Fugacity / Dustiness   | high   |
| <b>Frequency and duration of use</b>   |  |
| Duration of activity   | 15 mins to 1 hour  |
| Frequency of use   | 5 days / week  |



|  |   |
|--|---|
| <b>Human factors not influenced by risk management</b>   |   |
| Exposed skin surface   | 960 cm <sup>2</sup>   |
| <b>Other given operational conditions affecting workers exposure</b>   |   |
| Location   | indoors   |
| Domain   | industrial  |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |   |
| Local exhaust ventilation  | no  |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |   |
| Respiratory protection   | no  |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**  |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |   |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |   |
| <b>Contributing Scenario (9) controlling industrial worker exposure for PROC 8B</b>  |   |
| <b>Name of contributing scenario</b>   | 8b - Transfer of chemicals from/to vessels/ large containers at dedicated facilities  |
| <b>Exposure type</b>   | Inhalation: Short-term systemic<br>Dermal: Qualitative Risk Assessment  |
| <b>Qualitative Risk Assessment</b>   |   |
| General  | Ensure that gasalarms are installed<br>Ensure that the worker is in a separated (control) room with independent air supply<br>Provide specific employee training to prevent/minimize exposures.<br>Wear suitable face shield<br>Wear safety shoes during all process steps<br>Wear suitable respiratory protection.<br>Transfer via enclosed lines<br>Ensure material transfers are under containment or extract ventilation<br>In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.<br>Pumps and sampling stations are additionally isolated with a circumfluent water film.<br>Workers should wear portable gas sensors. |
| Dermal   | Use suitable chemically resistant gloves.<br>Wear suitable coveralls to prevent exposure to the skin.   |
| <b>Product characteristics</b>   |   |
| Physical state   | liquid  |
| Concentration in substance   | 100 %   |
| Fugacity / Dustiness   | high  |
| <b>Frequency and duration of use</b>   |   |
| Duration of activity   | 15 mins to 1 hour   |
| Frequency of use   | 5 days / week   |
| <b>Human factors not influenced by risk management</b>   |   |
| Exposed skin surface   | 960 cm <sup>2</sup>   |
| <b>Other given operational conditions affecting workers exposure</b>   |   |

|  |   |
|--|---|
| Location   | indoors   |
| Domain   | industrial  |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |   |
| Local exhaust ventilation  | no  |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |   |
| Respiratory protection   | no  |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**  |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |   |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |   |
| <b>Contributing Scenario (10) controlling industrial worker exposure for PROC 9</b>  |   |
| Name of contributing scenario  | 9 - Transfer of chemicals into small containers (dedicated filling line)  |
| Exposure type  | Inhalation: Long-term systemic<br>Dermal: Qualitative Risk Assessment   |
| <b>Qualitative Risk Assessment</b>   |   |
| General  | Ensure that gasalarms are installed<br>Ensure that the worker is in a separated (control) room with independent air supply<br>Provide specific employee training to prevent/minimize exposures.<br>Wear suitable face shield<br>Wear safety shoes during all process steps<br>Wear suitable respiratory protection.<br>Transfer via enclosed lines<br>Ensure material transfers are under containment or extract ventilation<br>In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.<br>Pumps and sampling stations are additionally isolated with a circumfluent water film.<br>Workers should wear portable gas sensors. |
| Dermal   | Use suitable chemically resistant gloves.<br>Wear suitable coveralls to prevent exposure to the skin.   |
| <b>Product characteristics</b>   |   |
| Physical state   | liquid  |
| Concentration in substance   | 100 %   |
| Fugacity / Dustiness   | high  |
| <b>Frequency and duration of use</b>   |   |
| Duration of activity   | 15 mins to 1 hour   |
| Frequency of use   | 5 days / week   |
| <b>Human factors not influenced by risk management</b>   |   |
| Exposed skin surface   | 480 cm <sup>2</sup>   |
| <b>Other given operational conditions affecting workers exposure</b>   |   |
| Location   | indoors   |
| Domain   | industrial  |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |   |
| Local exhaust ventilation  | no  |

| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |   |
|--|---|
| Respiratory protection   | no  |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**  |
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |   |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |   |
| <b>Contributing Scenario (11) controlling industrial worker exposure for PROC 9</b>  |   |
| Name of contributing scenario  | 9 - Transfer of chemicals into small containers (dedicated filling line)  |
| Exposure type  | Inhalation: Short-term systemic<br>Dermal: Qualitative Risk Assessment  |
| <b>Qualitative Risk Assessment</b>   |   |
| General  | Ensure that gasalarms are installed<br>Ensure that the worker is in a separated (control) room with independent air supply<br>Provide specific employee training to prevent/minimize exposures.<br>Wear suitable face shield<br>Wear safety shoes during all process steps<br>Wear suitable respiratory protection.<br>Transfer via enclosed lines<br>Ensure material transfers are under containment or extract ventilation<br>In case of leakage this system is connected to a water sprinkler system to avoid volatilization of the gaseous phase.<br>Pumps and sampling stations are additionally isolated with a circumfluent water film.<br>Workers should wear portable gas sensors. |
| Dermal   | Use suitable chemically resistant gloves.<br>Wear suitable coveralls to prevent exposure to the skin.   |
| <b>Product characteristics</b>   |   |
| Physical state   | liquid  |
| Concentration in substance   | 100 %   |
| Fugacity / Dustiness   | high  |
| <b>Frequency and duration of use</b>   |   |
| Duration of activity   | 15 mins to 1 hour   |
| Frequency of use   | 5 days / week   |
| <b>Human factors not influenced by risk management</b>   |   |
| Exposed skin surface   | 480 cm <sup>2</sup>   |
| <b>Other given operational conditions affecting workers exposure</b>   |   |
| Location   | indoors   |
| Domain   | industrial  |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |   |
| Local exhaust ventilation  | no  |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |   |
| Respiratory protection   | no  |
| Use of external/measured value inhalation  | Actual measured values* from regular external audits of facilities were used**  |

|  |  |
|--|--|
| * collected during regular external audits of the facilities, conducted by the national competent authority or an independent organization (e.g. TÜV). |  |
| **Applies for BASF only. (Recommendation: registrants should provide their own individual data, as well as the details of their sampling system.)      |  |
| <b>Contributing Scenario (12) controlling industrial worker exposure for PROC 15</b>   |  |
| <b>Name of contributing scenario</b>   | 15 - Use of laboratory reagents in small scale laboratories  |
| Exposure type  | Inhalation: Long-term systemic<br>Dermal: Qualitative Risk Assessment  |
| <b>Qualitative Risk Assessment</b>   |  |
| General  | Store substance within a closed system.<br>Provide specific employee training to prevent/minimize exposures.<br>Local exhaust ventilation<br>Wear suitable respiratory protection. |
| Dermal   | Use suitable chemically resistant gloves.  |
| <b>Product characteristics</b>   |  |
| Physical state   | liquid   |
| Concentration in substance   | 100 %  |
| Fugacity / Dustiness   | high   |
| <b>Frequency and duration of use</b>   |  |
| Duration of activity   | 15 mins to 1 hour  |
| Frequency of use   | 5 days / week  |
| <b>Human factors not influenced by risk management</b>   |  |
| Exposed skin surface   | 240 cm <sup>2</sup>  |
| <b>Other given operational conditions affecting workers exposure</b>   |  |
| Location   | indoors  |
| Domain   | industrial   |
| <b>Technical conditions and measures to control dispersion and exposure</b>  |  |
| Local exhaust ventilation  | no   |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>   |  |
| Respiratory protection   | 97.5 % ( <i>justification: RP 97.5% (full face shield)</i> )   |
| Local Exhaust ventilation  | inhalation: 99 % ( <i>justification: Appropriate local exhaust ventilation: Effectiveness: 99%</i> )   |
| <b>Contributing Scenario (13) controlling industrial worker exposure for PROC 15</b>   |  |
| <b>Name of contributing scenario</b>   | 15 - Use of laboratory reagents in small scale laboratories  |
| Exposure type  | Inhalation: Short-term systemic<br>Dermal: Qualitative Risk Assessment   |
| <b>Qualitative Risk Assessment</b>   |  |
| General  | Store substance within a closed system.<br>Provide specific employee training to prevent/minimize exposures.<br>Local exhaust ventilation<br>Wear suitable respiratory protection. |
| Dermal   | Use suitable chemically resistant gloves.  |
| <b>Product characteristics</b>   |  |
| Physical state   | liquid   |

|   |  |
|---|--|
| Concentration in substance  | 100 %  |
| Fugacity / Dustiness  | high   |
| <b>Frequency and duration of use</b>  |  |
| Duration of activity  | 15 mins to 1 hour  |
| Frequency of use  | 5 days / week  |
| <b>Human factors not influenced by risk management</b>  |  |
| Exposed skin surface  | 240 cm <sup>2</sup>  |
| <b>Other given operational conditions affecting workers exposure</b>  |  |
| Location  | indoors  |
| Domain  | industrial   |
| <b>Technical conditions and measures to control dispersion and exposure</b>   |  |
| Local exhaust ventilation   | no   |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b>                                    |  |
| Respiratory protection  | 97.5 % ( <i>justification: RP 97.5% (full face shield)</i> )   |
| Local Exhaust ventilation   | inhalation: 99 % ( <i>justification: Appropriate local exhaust ventilation: Effectiveness: 99%</i> )   |
| <b>Exposure Scenario 4 (ES4): PW-3: Use as a laboratory reagent</b>   |  |
| Free short title  | Use as a laboratory reagent  |
| Systematic title based on use descriptor  | ERC 8B; PROC 15  |
| Name of contributing environmental scenario and corresponding ERC   | ERC 8B - Wide dispersive indoor use of reactive substances in open systems   |
| Name(s) of contributing worker scenarios and corresponding PROCs  | PROC 15 - Use of laboratory reagents in small scale laboratories<br>PROC 15 - Use of laboratory reagents in small scale laboratories   |
| <b>Contributing Scenario (1) controlling environmental exposure for ERC 8B</b>  |  |
| As no environmental hazard was identified no environmental-related exposure assessment and risk characterization was performed. |  |
| <b>Contributing Scenario (2) controlling professional worker exposure for PROC 15</b>   |  |
| Name of contributing scenario   | 15 - Use of laboratory reagents in small scale laboratories  |
| Exposure type   | Inhalation: Long-term systemic<br>Dermal: Qualitative Risk Assessment  |
| <b>Qualitative Risk Assessment</b>  |  |
| General   | Store substance within a closed system.<br>Provide specific employee training to prevent/minimize exposures.<br>Local exhaust ventilation<br>Wear suitable respiratory protection. |
| Dermal  | Use suitable chemically resistant gloves.  |
| <b>Product characteristics</b>  |  |
| Physical state  | liquid   |
| Concentration in substance  | 100 %  |
| Fugacity / Dustiness  | high   |
| <b>Frequency and duration of use</b>  |  |
| Duration of activity  | 15 mins to 1 hour  |
| Frequency of use  | 5 days / week  |

|  |  |
|--|--|
| <b>Human factors not influenced by risk management</b>                                       |  |
| Exposed skin surface   | 240 cm <sup>2</sup>  |
| <b>Other given operational conditions affecting workers exposure</b>                         |  |
| Location   | indoors  |
| Domain   | professional   |
| <b>Technical conditions and measures to control dispersion and exposure</b>                  |  |
| Local exhaust ventilation  | no   |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b> |  |
| Respiratory protection   | 97.5 % ( <i>justification: RP 97.5% (full face shield)</i> )   |
| Local Exhaust ventilation  | inhalation: 99 % ( <i>justification: Appropriate local exhaust ventilation: Effectiveness: 99%</i> )   |
| <b>Contributing Scenario (3) controlling professional worker exposure for PROC 15</b>        |  |
| Name of contributing scenario  | 15 - Use of laboratory reagents in small scale laboratories  |
| Exposure type  | Inhalation: Short-term systemic<br>Dermal: Qualitative Risk Assessment   |
| <b>Qualitative Risk Assessment</b>   |  |
| General  | Store substance within a closed system.<br>Provide specific employee training to prevent/minimize exposures.<br>Local exhaust ventilation<br>Wear suitable respiratory protection. |
| Dermal   | Use suitable chemically resistant gloves.  |
| <b>Product characteristics</b>   |  |
| Physical state   | liquid   |
| Concentration in substance   | 100 %  |
| Fugacity / Dustiness   | high   |
| <b>Frequency and duration of use</b>   |  |
| Duration of activity   | 15 mins to 1 hour  |
| Frequency of use   | 5 days / week  |
| <b>Human factors not influenced by risk management</b>                                       |  |
| Exposed skin surface   | 240 cm <sup>2</sup>  |
| <b>Other given operational conditions affecting workers exposure</b>                         |  |
| Location   | indoors  |
| Domain   | professional   |
| <b>Technical conditions and measures to control dispersion and exposure</b>                  |  |
| Local exhaust ventilation  | no   |
| <b>Conditions and measures related to personal protection, hygiene and health evaluation</b> |  |
| Respiratory protection   | 97.5 % ( <i>justification: RP 97.5% (full face shield)</i> )   |
| Local Exhaust ventilation  | inhalation: 99 % ( <i>justification: Appropriate local exhaust ventilation: Effectiveness: 99%</i> )   |

**END OF SAFETY DATA SHEET**