

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

| | | | |
|---------|----------------|--------------|--------------------------------|
| Version | Revision Date: | SDS Number: | Date of last issue: 06.11.2023 |
| 1.1 | 28.12.2023 | 800010051827 | Print Date 04.01.2024 |

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

1.1 Product identifier

| | |
|-------------------------------|--|
| Trade name | : PROPYLENE OXIDE Sustainable |
| Product code | : U1151 |
| Registration number EU | : 01-2119480483-35-0004, 01-2119480483-35-0005 |
| CAS-No. | : 75-56-9 |
| Other means of identification | : Epoxy propane, 1,2-, Methyl ethylene oxide, Methyl oxirane, PO, Propylene epoxide, Propylene oxide, 1,2- |

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

| | |
|-----------------------------------|---|
| Use of the Sub- stance/Mixture | : Chemical intermediate. Please refer to section 16 and/or the annexes for the registered uses under REACH. |
| Uses advised against | : Restricted to professional users., This product must not be used in applications other than the above without first seeking the advice of the supplier. |

1.3 Details of the supplier of the safety data sheet

| | |
|----------------------------------|---|
| Manufacturer/Supplier | : Shell Chemicals Europe B.V. PO Box 2334 3000 CH Rotterdam Netherlands |
| Telephone | : +31 (0)10 441 5137 / +31 (0)10 441 5191 |
| Telefax | : +31 (0)20 716 8316 / +31 (0)20 713 9230 |
| Contact for Safety Data Sheet | : sccmsds@shell.com |

1.4 Emergency telephone number

+44 (0) 1235 239 670 (This telephone number is available 24 hours per day, 7 days per week)
Poisons Centre: 070 245 245

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification (REGULATION (EC) No 1272/2008)

| | |
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| Flammable liquids, Category 1 | H224: Extremely flammable liquid and vapour. |
| Acute toxicity, Category 4, Oral | H302: Harmful if swallowed. |

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According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

| | | | |
|---------|----------------|--------------|--------------------------------|
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| 1.1 | 28.12.2023 | 800010051827 | Print Date 04.01.2024 |

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| Acute toxicity, Category 3, Dermal | H311: Toxic in contact with skin. |
| Acute toxicity, Category 3, Inhalation | H331: Toxic if inhaled. |
| Eye irritation, Category 2 | H319: Causes serious eye irritation. |
| Specific target organ toxicity - single exposure, Category 3, Respiratory Tract | H335: May cause respiratory irritation. |
| Germ cell mutagenicity, Category 1B | H340: May cause genetic defects. |
| Carcinogenicity, Category 1B | H350: May cause cancer. |

2.2 Label elements

Labelling (REGULATION (EC) No 1272/2008)

Hazard pictograms :



Signal word : Danger

Hazard statements :

PHYSICAL HAZARDS:

H224 Extremely flammable liquid and vapour.

HEALTH HAZARDS:

H302 Harmful if swallowed.

H311 Toxic in contact with skin.

H331 Toxic if inhaled.

H319 Causes serious eye irritation.

H335 May cause respiratory irritation.

H340 May cause genetic defects.

H350 May cause cancer.

ENVIRONMENTAL HAZARDS:

Not classified as environmental hazard according to CLP criteria.

Precautionary statements : **Prevention:**

P201 Obtain special instructions before use.

P202 Do not handle until all safety precautions have been read and understood.

P210 Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.

P233 Keep container tightly closed.

P240 Ground/bond container and receiving equipment.

P241 Use explosion-proof electrical/ ventilating/ lighting equipment.

P242 Use only non-sparking tools.

P243 Take precautionary measures against static discharge.

P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

Version 1.1 Revision Date: 28.12.2023 SDS Number: 800010051827 Date of last issue: 06.11.2023
Print Date 04.01.2024

Response:

P310 Immediately call a POISON CENTER/ doctor.
P303 + P361 + P353 IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P301 + P312 IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell.
P330 Rinse mouth.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P322 Specific measures (see supplemental first aid instructions on this label).
P370 + P378 In case of fire: Use appropriate media to extinguish.

Storage:

P403 + P233 Store in a well-ventilated place. Keep container tightly closed.
P235 Keep cool.
P405 Store locked up.

Disposal:

P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Other hazards

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

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

Vapours are heavier than air. Vapours may travel across the ground and reach remote ignition sources causing a flashback fire danger.

Vapours may ignite and explode.

This material is a static accumulator.

Even with proper grounding and bonding, this material can still accumulate an electrostatic charge.

If sufficient charge is allowed to accumulate, electrostatic discharge and ignition of flammable air-vapour mixtures can occur.

SECTION 3: Composition/information on ingredients

3.1 Substances

Components

| Chemical name | CAS-No. EC-No. | Concentration (% w/w) |
|---------------|-------------------|-----------------------|
|---------------|-------------------|-----------------------|

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

Version 1.1 Revision Date: 28.12.2023 SDS Number: 800010051827 Date of last issue: 06.11.2023
Print Date 04.01.2024

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|-----------------|----------------------|--------|
| propylene oxide | 75-56-9 200-879-2 | <= 100 |
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SECTION 4: First aid measures

4.1 Description of first aid measures

- General advice : DO NOT DELAY.
Keep victim calm. Obtain medical treatment immediately.
- Protection of first-aiders : When administering first aid, ensure that you are wearing the appropriate personal protective equipment according to the incident, injury and surroundings.
- If inhaled : Call emergency number for your location / facility.
Remove to fresh air. Do not attempt to rescue the victim unless proper respiratory protection is worn. If the victim has difficulty breathing or tightness of the chest, is dizzy, vomiting, or unresponsive, give 100% oxygen with rescue breathing or Cardio-Pulmonary Resuscitation as required and transport to the nearest medical facility.
- In case of skin contact : Remove contaminated clothing. Immediately flush skin with large amounts of water for at least 15 minutes, and follow by washing with soap and water if available. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.
- In case of eye contact : Immediately flush eye(s) with plenty of water.
Remove contact lenses, if present and easy to do. Continue rinsing.
Transport to the nearest medical facility for additional treatment.
- If swallowed : If swallowed, do not induce vomiting: transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration. Rinse mouth.

4.2 Most important symptoms and effects, both acute and delayed

- Symptoms : Respiratory irritation signs and symptoms may include a temporary burning sensation of the nose and throat, coughing, and/or difficulty breathing.
Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, light-headedness, headache, nausea and loss of coordination.
Continued inhalation may result in unconsciousness and death.

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

| | | | |
|---------|----------------|--------------|--------------------------------|
| Version | Revision Date: | SDS Number: | Date of last issue: 06.11.2023 |
| 1.1 | 28.12.2023 | 800010051827 | Print Date 04.01.2024 |

Skin irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blisters.
Eye irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blurred vision.
Ingestion may result in nausea, vomiting and/or diarrhoea.
Peripheral nerve damage may be evidenced by impairment of motor function (incoordination, unsteady walk, or muscle weakness in the extremities, and/or loss of sensation in the arms and legs).

4.3 Indication of any immediate medical attention and special treatment needed

Treatment : IMMEDIATE TREATMENT IS EXTREMELY IMPORTANT!
Artificial respiration may be required.
Call a doctor or poison control center for guidance.
Treat symptomatically.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media : Large fires should only be fought by properly trained fire fighters.
Alcohol-resistant foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.
Do not discharge extinguishing waters into the aquatic environment.

Unsuitable extinguishing media : Do not use water in a jet.

5.2 Special hazards arising from the substance or mixture

Specific hazards during fire-fighting : Flammable vapours may be present even at temperatures below the flash point.
Will float and can be reignited on surface water.
The vapour is heavier than air, spreads along the ground and distant ignition is possible.
Carbon monoxide may be evolved if incomplete combustion occurs.
Contents are under pressure and can explode when exposed to heat or flames.

5.3 Advice for firefighters

Special protective equipment for firefighters : Proper protective equipment including chemical resistant gloves are to be worn; chemical resistant suit is indicated if large contact with spilled product is expected. Self-Contained Breathing Apparatus must be worn when approaching a fire in a confined space. Select fire fighter's clothing approved to relevant Standards (e.g. Europe: EN469).

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

| | | | |
|---------|----------------|--------------|--------------------------------|
| Version | Revision Date: | SDS Number: | Date of last issue: 06.11.2023 |
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| | |
|--------------------------------|--|
| Specific extinguishing methods | : Standard procedure for chemical fires. |
| Further information | : Clear fire area of all non-emergency personnel. All storage areas should be provided with adequate fire fighting facilities. Keep adjacent containers cool by spraying with water. |

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

| | |
|----------------------|---|
| Personal precautions | : Observe all relevant local and international regulations. Risk of explosion. Inform the emergency services if liquid enters surface water drains. Notify authorities if any exposure to the general public or the environment occurs or is likely to occur. Local authorities should be advised if significant spillages cannot be contained. 6.1.1 For non emergency personnel: Avoid contact with spilled or released material. For guidance on selection of personal protective equipment see Section 8 of this Safety Data Sheet. Isolate hazard area and deny entry to unnecessary or unprotected personnel. Stay upwind and keep out of low areas. 6.1.2 For emergency responders: Avoid contact with spilled or released material. For guidance on selection of personal protective equipment see Section 8 of this Safety Data Sheet. Isolate hazard area and deny entry to unnecessary or unprotected personnel. Stay upwind and keep out of low areas. Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks. Note - Since the danger of fire is so great, bunker gear worn over protective clothing is highly recommended. |
|----------------------|---|

6.2 Environmental precautions

| | |
|---------------------------|---|
| Environmental precautions | : Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area. Use appropriate containment to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Attempt to disperse the vapour or to direct its flow to a safe location, for example by using fog sprays. |
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6.3 Methods and material for containment and cleaning up

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| Methods for cleaning up | : Large spillage: |
|-------------------------|-------------------|

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

| | | | |
|----------------|------------------------------|-----------------------------|---|
| Version 1.1 | Revision Date: 28.12.2023 | SDS Number: 800010051827 | Date of last issue: 06.11.2023 Print Date 04.01.2024 |
|----------------|------------------------------|-----------------------------|---|

Prevent from spreading by making a barrier with sand, earth or other containment material.
Remove with explosion-proof vacuum trucks or pump to storage/salvage vessels.
Test atmosphere for vapours to ensure safe working conditions before other personnel are allowed into area.
Treat residues as for small spillage.

Small spillage:
Soak up residue with an absorbent such as clay, sand or other suitable material and dispose of properly.
Allow to evaporate.
Retain washings as contaminated waste.
Note that aqueous solutions have a low flash point unless very dilute.

6.4 Reference to other sections

For guidance on selection of personal protective equipment see Section 8 of this Safety Data Sheet.,
For guidance on disposal of spilled material see Section 13 of this Safety Data Sheet.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

- | | |
|-------------------------|---|
| Technical measures | : <ul style="list-style-type: none">Avoid breathing of or direct contact with material. Only use in well ventilated areas. Wash thoroughly after handling. For guidance on selection of personal protective equipment see Section 8 of this Safety Data Sheet.Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material.Ensure that all local regulations regarding handling and storage facilities are followed. |
| Advice on safe handling | : <ul style="list-style-type: none">Avoid exposure. Obtain special instructions before use.Avoid inhaling vapour and/or mists.Avoid contact with skin, eyes and clothing.Monitor concentrations in air at regular intervals.Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks.This product is intended for use in closed systems only.Handling Temperature: Ambient.Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols.Bulk storage tanks should be diked (bunded).Properly dispose of any contaminated rags or cleaning materials in order to prevent fires.Even with proper grounding and bonding, this material can still accumulate an electrostatic charge.If sufficient charge is allowed to accumulate, electrostatic dis- |

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

| | | | |
|---------|----------------|--------------|--------------------------------|
| Version | Revision Date: | SDS Number: | Date of last issue: 06.11.2023 |
| 1.1 | 28.12.2023 | 800010051827 | Print Date 04.01.2024 |

charge and ignition of flammable air-vapour mixtures can occur.

Be aware of handling operations that may give rise to additional hazards that result from the accumulation of static charges.

These include but are not limited to pumping (especially turbulent flow), mixing, filtering, splash filling, cleaning and filling of tanks and containers, sampling, switch loading, gauging, vacuum truck operations, and mechanical movements.

These activities may lead to static discharge e.g. spark formation.

Restrict line velocity during pumping in order to avoid generation of electrostatic discharge (≤ 1 m/s until fill pipe submerged to twice its diameter, then ≤ 7 m/s). Avoid splash filling.

Do NOT use compressed air for filling, discharging, or handling operations.

- | | | |
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| Product Transfer | : | If positive displacement pumps are used, these must be fitted with a non-integral pressure relief valve. Lines should be purged with nitrogen before and after product transfer. Refer to supplier for further product transfer instructions if required. Refer to guidance under Handling section. |
| Hygiene measures | : | Wash hands before eating, drinking, smoking and using the toilet. Launder contaminated clothing before re-use. |

7.2 Conditions for safe storage, including any incompatibilities

- | | | |
|---|---|---|
| Requirements for storage areas and containers | : | Refer to section 15 for any additional specific legislation covering the packaging and storage of this product. |
| Further information on storage stability | : | <p>Keep away from aerosols, flammables, oxidizing agents, corrosives and from other flammable products which are not harmful or toxic to man or to the environment.</p> <p>A reliable fixed sprinkler/deluge system should be installed.</p> <p>Tanks must be clean, dry and rust-free.</p> <p>Prevent ingress of water.</p> <p>Must be stored in a diked (bunded) well-ventilated area, away from sunlight, ignition sources and other sources of heat.</p> <p>Tanks should be fitted with a vapour recovery system.</p> <p>Vapours from tanks should not be released to atmosphere.</p> <p>Breathing losses during storage should be controlled by a suitable vapour treatment system.</p> <p>Tanks must be specifically designed for use with this product.</p> <p>Cleaning, inspection and maintenance of storage tanks is a specialist operation, which requires the implementation of strict procedures and precautions.</p> <p>These include issuing of work permits, gas-freeing of tanks, using a manned harness and lifelines and wearing air-supplied breathing apparatus.</p> |

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

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

Version 1.1 Revision Date: 28.12.2023 SDS Number: 800010051827 Date of last issue: 06.11.2023
Print Date 04.01.2024

Use lowest practicable storage temperatures and avoid through-draughts of air to minimise risk of generating a flammable condition in the tank space.
Electrostatic charges will be generated during pumping. Electrostatic discharge may cause fire. Ensure electrical continuity by bonding and grounding (earthing) all equipment to reduce the risk.
The vapours in the head space of the storage vessel may lie in the flammable/explosive range and hence may be flammable.

Packaging material : Suitable material: Stainless steel., Mild steel.
Unsuitable material: Plastics, Aluminum

7.3 Specific end use(s)

Specific use(s) : Please refer to section 16 and/or the annexes for the registered uses under REACH.

Ensure that all local regulations regarding handling and storage facilities are followed.
See additional references that provide safe handling practices: American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practices on Static Electricity).
IEC/TS 60079-32-1: Electrostatic hazards, guidance

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational Exposure Limits

| Components | CAS-No. | Value type (Form of exposure) | Control parameters | Basis |
|---|---------|-------------------------------|--------------------------------|--|
| propylene oxide | 75-56-9 | TLV 8 hr | 1 ppm 2,4 mg/m ³ | BE OEL |
| Further information: This substance is part of the scope of the Royal decree of 2th December 1993 on the protection of workers against the risk of exposure to carcinogenic and mutagenic agents at labour. | | | | |
| propylene oxide | | TWA | 1 ppm 2,4 mg/m ³ | 2004/37/EC |
| Further information: Carcinogens or mutagens | | | | |
| propylene oxide | | TWA | 1 ppm 2,4 mg/m ³ | Shell Internal Standard (SIS) for 8-12 hour TWA. |

Biological occupational exposure limits

No biological limit allocated.

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

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

Version 1.1 Revision Date: 28.12.2023 SDS Number: 800010051827 Date of last issue: 06.11.2023
Print Date 04.01.2024

| Substance name | End Use | Exposure routes | Potential health effects | Value |
|-----------------|---------|-----------------|--------------------------|-----------------------|
| propylene oxide | Workers | Inhalation | Acute local effects | 170 mg/m ³ |
| propylene oxide | Workers | Inhalation | Long-term local effects | 2,4 mg/m ³ |

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

| Substance name | Environmental Compartment | Value |
|-----------------|---------------------------|-------------------------|
| propylene oxide | Fresh water | 0,052 mg/l |
| propylene oxide | Sediment | 0,245 mg/kg |
| propylene oxide | Soil | 0,0186 mg/kg wet weight |
| propylene oxide | Sewage treatment plant | 10 mg/l |

8.2 Exposure controls

Engineering measures

Read in conjunction with the Exposure Scenario for your specific use contained in the Annex. 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.

Local exhaust ventilation is recommended.

Firewater monitors and deluge systems are recommended.

Items that cannot be decontaminated should be destroyed (see Chapter 13).

Eye washes and showers for emergency use.

General Information:

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

Personal protective equipment

Read in conjunction with the Exposure Scenario for your specific use contained in the Annex. The provided information is made in consideration of the PPE directive (Council Directive 89/686/EEC) and the CEN European Committee for Standardisation (CEN) standards.

Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.

Eye protection : Wear goggles for use against liquids and gas, combined with face shield.
Approved to EU Standard EN166.

Hand protection

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

| | | | |
|----------------|------------------------------|-----------------------------|---|
| Version 1.1 | Revision Date: 28.12.2023 | SDS Number: 800010051827 | Date of last issue: 06.11.2023 Print Date 04.01.2024 |
|----------------|------------------------------|-----------------------------|---|

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| Remarks | : Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection. Longer term protection: Butyl rubber. Incidental contact/Splash protection: Nitrile rubber gloves. Silver Shield. For continuous contact we recommend gloves with breakthrough time of more than 240 minutes with preference for > 480 minutes where suitable gloves can be identified. For short-term/splash protection we recommend the same but recognize that suitable gloves offering this level of protection may not be available and in this case a lower breakthrough time maybe acceptable so long as appropriate maintenance and replacement regimes are followed. Glove thickness is not a good predictor of glove resistance to a chemical as it is dependent on the exact composition of the glove material. Glove thickness should be typically greater than 0.35 mm depending on the glove make and model. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended. |
| Skin and body protection | : Wear antistatic and flame-retardant clothing. Wear chemical resistant gloves/gauntlets and boots. Where risk of splashing, also wear an apron. Protective clothing approved to EU Standard EN14605. |
| Respiratory protection | : If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are unsuitable (e.g. airborne concentrations are high, risk of oxygen deficiency, confined space) use appropriate positive pressure breathing apparatus. Where air-filtering respirators are suitable, select an appropriate combination of mask and filter. If air-filtering respirators are suitable for conditions of use: Select a filter suitable for organic gases and vapours [Type AX boiling point < 65°C (149°F)] meeting EN14387. |

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

| | | | |
|---------|----------------|--------------|--------------------------------|
| Version | Revision Date: | SDS Number: | Date of last issue: 06.11.2023 |
| 1.1 | 28.12.2023 | 800010051827 | Print Date 04.01.2024 |

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|--|---|---|
| Physical state | : | Oily liquid. |
| Colour | : | Colourless to yellowish |
| Odour | : | Ethereal |
| Odour Threshold | : | 35 ppm |
| Melting / freezing point | : | -112 °C |
| Boiling point/boiling range | : | 35 °C |
| Flammability | | |
| Flammability (solid, gas) | : | Not applicable |
| Lower explosion limit and upper explosion limit / flammability limit | | |
| Upper explosion limit / upper flammability limit | : | 37,0 %(V) |
| Lower explosion limit / Lower flammability limit | : | 1,7 %(V) |
| Flash point | : | -37 °C Method: Tag Closed Cup (ASTM D56) |
| Auto-ignition temperature | : | 490 °C |
| Decomposition temperature | | |
| Decomposition temperature | : | Data not available |
| pH | : | Data not available |
| Viscosity | | |
| Viscosity, dynamic | : | 0,58 mPa.s (20 °C) Method: ASTM D445 |
| Viscosity, kinematic | : | 0,374 mm ² /s (20 °C) Method: ASTM D445 0,447 mm ² /s (0 °C) Method: ASTM D445 |
| Solubility(ies) | | |
| Water solubility | : | 405 kg/m ³ (20 °C) |
| Solubility in other solvents | : | Data not available |
| Partition coefficient: n-octanol/water | : | log Pow: 0,03 |

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

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| | | | |
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| Version | Revision Date: | SDS Number: | Date of last issue: 06.11.2023 |
| 1.1 | 28.12.2023 | 800010051827 | Print Date 04.01.2024 |

| | | |
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| Vapour pressure | : | 25,1 kPa (0 °C) |
| Relative density | : | 0,824 (3,89 °C) Method: ASTM D4052 |
| Density | : | 830 kg/m ³ (20 °C) Method: ASTM D4052 |
| Relative vapour density | : | 3,6 |
| Particle characteristics Particle size | : | Data not available |

9.2 Other information

| | | |
|----------------------|---|--|
| Explosives | : | Not classified |
| Oxidizing properties | : | Data not available |
| Evaporation rate | : | ca. 12 Method: ASTM D 3539, nBuAc=1 |
| Conductivity | : | Low conductivity: < 100 pS/m |

The conductivity of this material makes it a static accumulator. A liquid is typically considered nonconductive if its conductivity is below 100 pS/m and is considered semi-conductive if its conductivity is below 10,000 pS/m. Whether a liquid is nonconductive or semi-conductive, the precautions are the same. A number of factors, for example liquid temperature, presence of contaminants, and anti-static additives can greatly influence the conductivity of a liquid

| | | |
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| Surface tension | : | 71,5 mN/m, 15 °C |
| Molecular weight | : | 58,01 g/mol |

SECTION 10: Stability and reactivity

10.1 Reactivity

Material will polymerise at elevated temperatures 122 °F (50 °C) or if contaminated with water.

10.2 Chemical stability

No hazardous reaction is expected when handled and stored according to provisions

10.3 Possibility of hazardous reactions

| | | |
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| Hazardous reactions | : | Reacts violently with strong oxidising agents. Reacts with strong acids. |
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10.4 Conditions to avoid

| | | |
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| Conditions to avoid | : | Heat, flames, and sparks. |
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SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

| | | | |
|---------|----------------|--------------|--------------------------------|
| Version | Revision Date: | SDS Number: | Date of last issue: 06.11.2023 |
| 1.1 | 28.12.2023 | 800010051827 | Print Date 04.01.2024 |

Prevent vapour accumulation.
Temperatures above 30 °C / 86 °F.

10.5 Incompatible materials

Materials to avoid : Clay-based absorbents.
Bases, ammonia, primary and secondary amines, water and acids.
Heavy metals, alkali metals, alkali metal hydroxides, anhydrous chlorides of aluminium. iron, tin, copper and its alloys.
Strong oxidising agents.

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, sulphur oxides and unidentified organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation.

Unknown toxic products may be formed.

SECTION 11: Toxicological information

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

Information on likely routes of exposure : Inhalation is the primary route of exposure.

Acute toxicity

Components:

propylene oxide:

| | |
|---------------------------|---|
| Acute oral toxicity | : LD 50 (Rat, male and female): > 300 - <= 2000 mg/kg Method: Test(s) equivalent or similar to OECD Test Guideline 401 Remarks: Harmful if swallowed. |
| Acute inhalation toxicity | : LC 50 (Rat, male and female): > 2 -<= 10 mg/l Exposure time: 4 h Test atmosphere: vapour Method: Test(s) equivalent or similar to OECD Test Guideline 403 Remarks: Toxic if inhaled. High concentrations may cause central nervous system depression resulting in headaches, dizziness and nausea. |
| Acute dermal toxicity | : LD 50 (Rabbit): > 200 - <= 1000 mg/kg Method: Literature data Remarks: Toxic in contact with skin. The current CLP-based labelling of acute dermal toxicity (Category 3; H311) is inaccurate due to a mathematical error having occurred when conducting a unit conversion for the referenced dermal LD50 value of 1.5 mL/kg bw to 950 mg/kg bw. |

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

| | | | |
|---------|----------------|--------------|--------------------------------|
| Version | Revision Date: | SDS Number: | Date of last issue: 06.11.2023 |
| 1.1 | 28.12.2023 | 800010051827 | Print Date 04.01.2024 |

The referenced dermal LD50 is correctly converted to 1,245 mg/kg bw (Category 4; H312) based on propylene oxide relative density (0.830 at 20°C).

Skin corrosion/irritation

Components:

propylene oxide:

| | | |
|---------|---|-------------------------|
| Species | : | Rabbit |
| Method | : | OECD Test Guideline 404 |
| Remarks | : | Not irritating to skin. |

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

Serious eye damage/eye irritation

Components:

propylene oxide:

| | | |
|---------|---|--------------------------------|
| Species | : | Rabbit |
| Method | : | Literature data |
| Remarks | : | Causes serious eye irritation. |

Respiratory or skin sensitisation

Components:

propylene oxide:

| | | |
|---------|---|---|
| Species | : | Guinea pig |
| Method | : | Acceptable non-standard method. |
| Remarks | : | Based on available data, the classification criteria are not met. |

Germ cell mutagenicity

Components:

propylene oxide:

| | | |
|-----------------------|---|--|
| Genotoxicity in vitro | : | Method: OECD Test Guideline 471 Remarks: May cause genetic defects. |
|-----------------------|---|--|

Method: OECD Test Guideline 473
Remarks: May cause genetic defects.

Method: OECD Test Guideline 476
Remarks: May cause genetic defects.

| | | |
|----------------------|---|-------------------------------------|
| Genotoxicity in vivo | : | Remarks: May cause genetic defects. |
|----------------------|---|-------------------------------------|

| | | |
|------------------------------------|---|----------------------------|
| Germ cell mutagenicity- Assessment | : | May cause genetic defects. |
|------------------------------------|---|----------------------------|

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

Version 1.1 Revision Date: 28.12.2023 SDS Number: 800010051827 Date of last issue: 06.11.2023
Print Date 04.01.2024

Carcinogenicity

Components:

propylene oxide:

Species : Mouse, male and female
Application Route : Inhalation
Method : Test(s) equivalent or similar to OECD Test Guideline 451
Remarks : May cause cancer.

Carcinogenicity - Assessment : May cause cancer.

| Material | GHS/CLP Carcinogenicity Classification |
|-----------------|--|
| propylene oxide | Carcinogenicity Category 1B |

| Material | Other Carcinogenicity Classification |
|-----------------|---|
| propylene oxide | IARC: Group 2B: Possibly carcinogenic to humans |

Reproductive toxicity

Components:

propylene oxide:

Effects on fertility : Species: Rat
Sex: male and female
Application Route: Inhalation

Method: Equivalent or similar to OECD Test Guideline 416
Remarks: Based on available data, the classification criteria are not met.

Reproductive toxicity - Assessment : This product does not meet the criteria for classification in categories 1A/1B.

STOT - single exposure

Components:

propylene oxide:

Exposure routes : Inhalation
Target Organs : Respiratory Tract
Remarks : May cause respiratory irritation.

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

| | | | |
|---------|----------------|--------------|--------------------------------|
| Version | Revision Date: | SDS Number: | Date of last issue: 06.11.2023 |
| 1.1 | 28.12.2023 | 800010051827 | Print Date 04.01.2024 |

STOT - repeated exposure

Components:

propylene oxide:

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

Repeated dose toxicity

Components:

propylene oxide:

| | | |
|-------------------|---|---------------------------------|
| Species | : | Rat, male and female |
| Application Route | : | Inhalation |
| Test atmosphere | : | vapour |
| Method | : | OECD Test Guideline 453 |
| Target Organs | : | No specific target organs noted |

Aspiration toxicity

Components:

propylene oxide:

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

11.2 Information on other hazards

Endocrine disrupting properties

Product:

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

Further information

Product:

Remarks : Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).

Components:

propylene oxide:

Remarks : Classifications by other authorities under varying regulatory frameworks may exist.

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

| | | | |
|---------|----------------|--------------|--------------------------------|
| Version | Revision Date: | SDS Number: | Date of last issue: 06.11.2023 |
| 1.1 | 28.12.2023 | 800010051827 | Print Date 04.01.2024 |

SECTION 12: Ecological information

12.1 Toxicity

Components:

propylene oxide:

- | | | |
|--|---|---|
| Toxicity to fish | : | LC50 (Oncorhynchus mykiss (rainbow trout)): 52 mg/l Exposure time: 96 h Method: Test(s) equivalent or similar to OECD Guideline 203 Remarks: Harmful LL/EL/IL50 >10 <= 100 mg/l |
| Toxicity to daphnia and other aquatic invertebrates | : | EC50 (Daphnia magna (Water flea)): 350 mg/l Exposure time: 48 h Method: Test(s) equivalent or similar to OECD Guideline 202 Remarks: Practically non toxic: LL/EL/IL50 > 100 mg/l |
| Toxicity to algae/aquatic plants | : | EC50 (Pseudokirchneriella subcapitata (algae)): 240 mg/l Exposure time: 96 h Method: Test(s) equivalent or similar to OECD Test Guideline 201 Remarks: Practically non toxic: LL/EL/IL50 > 100 mg/l |
| Toxicity to microorganisms | : | Remarks: Practically non toxic: LL/EL/IL50 > 100 mg/l |
| Toxicity to fish (Chronic toxicity) | : | Remarks: Data not available |
| Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity) | : | Remarks: Data not available |

12.2 Persistence and degradability

Components:

propylene oxide:

- | | | |
|------------------|---|--|
| Biodegradability | : | Biodegradation: 89 % Exposure time: 28 d Method: OECD Test Guideline 301C Remarks: Readily biodegradable. |
|------------------|---|--|

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

| | | | |
|---------|----------------|--------------|--------------------------------|
| Version | Revision Date: | SDS Number: | Date of last issue: 06.11.2023 |
| 1.1 | 28.12.2023 | 800010051827 | Print Date 04.01.2024 |

12.3 Bioaccumulative potential

Components:

propylene oxide:

Bioaccumulation : Remarks: Does not bioaccumulate significantly.

12.4 Mobility in soil

Components:

propylene oxide:

Mobility : Remarks: Dissolves in water., If the product enters soil, one or more constituents will or may be mobile and may contaminate groundwater.

12.5 Results of PBT and vPvB assessment

Components:

propylene oxide:

Assessment : The substance does not fulfill all screening criteria for persistence, bioaccumulation and toxicity and hence is not considered to be PBT or vPvB..

12.6 Endocrine disrupting properties

Product:

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

12.7 Other adverse effects

Product:

Additional ecological information : Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product : Recover or recycle if possible.
It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations.

Do not dispose into the environment, in drains or in water

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

| | | | |
|---------|----------------|--------------|--------------------------------|
| Version | Revision Date: | SDS Number: | Date of last issue: 06.11.2023 |
| 1.1 | 28.12.2023 | 800010051827 | Print Date 04.01.2024 |

courses.

Waste product should not be allowed to contaminate soil or water.

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.

Waste, spills or used product is dangerous waste.

Contaminated packaging : Drain container thoroughly.
After draining, vent in a safe place away from sparks and fire.
Residues may cause an explosion hazard. Do not puncture, cut or weld uncleaned drums.
Send to drum recoverer or metal reclaimer.

Dispose in accordance with prevailing regulations, preferably to a recognized collector or contractor. The competence of the collector or contractor should be established beforehand.
Disposal should be in accordance with applicable regional, national, and local laws and regulations.

SECTION 14: Transport information

14.1 UN number or ID number

| | |
|------|--------|
| ADN | : 1280 |
| ADR | : 1280 |
| RID | : 1280 |
| IMDG | : 1280 |
| IATA | : 1280 |

14.2 UN proper shipping name

| | |
|------|-------------------|
| ADN | : PROPYLENE OXIDE |
| ADR | : PROPYLENE OXIDE |
| RID | : PROPYLENE OXIDE |
| IMDG | : PROPYLENE OXIDE |
| IATA | : PROPYLENE OXIDE |

14.3 Transport hazard class(es)

| | |
|------|-----|
| ADN | : 3 |
| ADR | : 3 |
| RID | : 3 |
| IMDG | : 3 |
| IATA | : 3 |

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

| | | | |
|---------|----------------|--------------|--------------------------------|
| Version | Revision Date: | SDS Number: | Date of last issue: 06.11.2023 |
| 1.1 | 28.12.2023 | 800010051827 | Print Date 04.01.2024 |

14.4 Packing group

ADN

| | |
|-----------------------------------|----------------------------|
| Packing group | : I |
| Classification Code | : F1 |
| Labels | : INST (N3, CMR, 3) |
| CDNI Inland Water Waste Agreement | : NST 8191 Propylene oxide |

ADR

| | |
|------------------------------|------|
| Packing group | : I |
| Classification Code | : F1 |
| Hazard Identification Number | : 33 |
| Labels | : 3 |

RID

| | |
|------------------------------|------|
| Packing group | : I |
| Classification Code | : F1 |
| Hazard Identification Number | : 33 |
| Labels | : 3 |

IMDG

| | |
|---------------|-----|
| Packing group | : I |
| Labels | : 3 |

IATA

| | |
|---------------|-----|
| Packing group | : I |
| Labels | : 3 |

14.5 Environmental hazards

ADN

| | |
|---------------------------|------|
| Environmentally hazardous | : no |
|---------------------------|------|

ADR

| | |
|---------------------------|------|
| Environmentally hazardous | : no |
|---------------------------|------|

RID

| | |
|---------------------------|------|
| Environmentally hazardous | : no |
|---------------------------|------|

IMDG

| | |
|------------------|------|
| Marine pollutant | : no |
|------------------|------|

14.6 Special precautions for user

| | |
|---------|--|
| Remarks | : Special Precautions: Refer to Section 7, Handling & Storage, for special precautions which a user needs to be aware of or needs to comply with in connection with transport. |
|---------|--|

14.7 Maritime transport in bulk according to IMO instruments

| | |
|--------------------|-------------------|
| Pollution category | : Y |
| Ship type | : 2 |
| Product name | : Propylene oxide |

| | |
|------------------------|---|
| Additional Information | : This product may be transported under nitrogen blanketing. Nitrogen is an odourless and invisible gas. Exposure to nitrogen enriched atmospheres displaces available oxygen which |
|------------------------|---|

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

| | | | |
|----------------|------------------------------|-----------------------------|---|
| Version 1.1 | Revision Date: 28.12.2023 | SDS Number: 800010051827 | Date of last issue: 06.11.2023 Print Date 04.01.2024 |
|----------------|------------------------------|-----------------------------|---|

may cause asphyxiation or death. Personnel must observe strict safety precautions when involved with a confined space entry.

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

SECTION 15: Regulatory information

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

REACH - List of substances subject to authorisation (Annex XIV) : Product is not subject to Authorisation under REACH.

REACH - Candidate List of Substances of Very High Concern for Authorisation (Article 59). : propylene oxide

Seveso III: Directive 2012/18/EU of the European Parliament and of the Council on the control of major-accident hazards involving dangerous substances. 21 Propylene oxide

Other regulations:

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

Product is subject to the cooperation agreement (SWA3) on the control of major-accident hazards involving dangerous substances, based on Seveso III directive (2012/18/EU).

The components of this product are reported in the following inventories:

AIIC : Listed

DSL : Listed

IECSC : Listed

ENCS : Listed

KECI : Listed

NZIoC : Listed

PICCS : Listed

TSCA : Listed

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

| | | | |
|---------|----------------|--------------|--------------------------------|
| Version | Revision Date: | SDS Number: | Date of last issue: 06.11.2023 |
| 1.1 | 28.12.2023 | 800010051827 | Print Date 04.01.2024 |

TCSI : Listed

15.2 Chemical safety assessment

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

SECTION 16: Other information

Full text of other abbreviations

| | | |
|-------------------|---|---|
| 2004/37/EC | : | Europe. Directive 2004/37/EC on the protection of workers from the risks related to exposure to carcinogens or mutagens at work |
| BE OEL | : | Belgium. Occupational exposure limit values |
| 2004/37/EC / TWA | : | Long term exposure limit |
| BE OEL / TLV 8 hr | : | Long term exposure limit |

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

Further information

Training advice : Provide adequate information, instruction and training for operators.

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

| | | | |
|---------|----------------|--------------|--------------------------------|
| Version | Revision Date: | SDS Number: | Date of last issue: 06.11.2023 |
| 1.1 | 28.12.2023 | 800010051827 | Print Date 04.01.2024 |

Other information : For Industry guidance and tools on REACH please visit the CEFIC website at <http://cefic.org/Industry-support>.
The substance does not fulfill all screening criteria for persistence, bioaccumulation and toxicity and hence is not considered to be PBT or vPvB.

A vertical bar (|) in the left margin indicates an amendment from the previous version.

This product is classified as R22/H302 Harmful if swallowed. The same control advice applies to all uses of this product and is included in Section 8 of the SDS. An exposure scenario is not presented.

Sources of key data used to compile the Safety Data Sheet : The quoted data are from, but not limited to, one or more sources of information (e.g. toxicological data from Shell Health Services, material suppliers' data, CONCAWE, EU IUCLID data base, EC 1272 regulation, etc).

Classification of the mixture:

| | |
|--------------|------|
| Flam. Liq. 1 | H224 |
| Acute Tox. 4 | H302 |
| Acute Tox. 3 | H311 |
| Acute Tox. 3 | H331 |
| Eye Irrit. 2 | H319 |
| STOT SE 3 | H335 |
| Muta. 1B | H340 |
| Carc. 1B | H350 |

Classification procedure:

On basis of test data.

Expert judgement and weight of evidence determination.

Expert judgement and weight of evidence determination.

Expert judgement and weight of evidence determination.

Expert judgement and weight of evidence determination.

Expert judgement and weight of evidence determination.

Expert judgement and weight of evidence determination.

Expert judgement and weight of evidence determination.

Identified Uses according to the Use Descriptor System

Uses - Worker

Title : Manufacture of substance- Industrial

Uses - Worker

Title : Use as an intermediate- Industrial

Uses - Worker

Title : Distribution of substance- Industrial

Uses - Worker

Title : Polymer production- Industrial

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

| | | | |
|---------|----------------|--------------|--------------------------------|
| Version | Revision Date: | SDS Number: | Date of last issue: 06.11.2023 |
| 1.1 | 28.12.2023 | 800010051827 | Print Date 04.01.2024 |

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

BE / EN

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

Version 1.1 Revision Date: 28.12.2023 SDS Number: 800010051827 Date of last issue: 06.11.2023
Print Date 04.01.2024

Exposure Scenario - Worker

| | |
|-------------------------|---|
| 300000000236 | |
| SECTION 1 | EXPOSURE SCENARIO TITLE |
| Title | Manufacture of substance- Industrial |
| Use Descriptor | Sector of Use: SU3, SU8 Process Categories: PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC15 Environmental Release Categories: ERC1 |
| Scope of process | Manufacture of the substance or use as a process chemical or extraction agent within closed or contained systems. Includes incidental exposures during recycling/ recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (including marine vessel/barge, road/rail car and bulk container). |

| SECTION 2 | OPERATIONAL CONDITIONS AND RISK MANAGEMENT MEASURES | |
|---|--|--|
| Section 2.1 | Control of Worker Exposure | |
| Product Characteristics | | |
| Physical form of product | Liquid, vapour pressure > 10 kPa at STP | |
| Concentration of the Substance in Mixture/Article | Covers percentage substance in the product up to 100%., Unless stated otherwise., | |
| Frequency and Duration of Use | | |
| Covers daily exposures up to 8 hours (unless stated differently). | | |
| Other Operational Conditions affecting Exposure | | |
| Assumes activities are at ambient temperature (unless stated differently). Assumes a good basic standard of occupational hygiene is implemented. | | |
| Contributing Scenarios | Risk Management Measures | |
| General measures (carcinogens). | Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when there is potential for inhalation; clear up spills immediately and dispose of wastes safely.Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance. | |

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

Version 1.1 Revision Date: 28.12.2023 SDS Number: 800010051827 Date of last issue: 06.11.2023
Print Date 04.01.2024

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|---|--|
| General exposures (closed systems) | No other specific measures identified. |
| General exposures (closed systems)with sample collection | Sample via a closed loop or other system to avoid exposure Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Avoid carrying out activities involving exposure for more than 4 hours , or: Wear a respirator conforming to EN140 with Type AX filter or better. |
| Laboratory activities | Handle in a fume cupboard or under extract ventilation. Provide a good standard of general or controlled ventilation (5 to 15 air changes per hour). |
| Bulk closed loading and unloading.Road tanker/rail car loading.Marine vessel/barge (un)loading. | Use dry break couplings for material transfer. , or: Wear a respirator conforming to EN140 with Type AX filter or better. Avoid carrying out activities involving exposure for more than 1 hour. |
| Equipment cleaning and maintenance | Drain down and flush system prior to equipment opening or maintenance. Retain drain downs in sealed storage pending disposal or for subsequent recycle. Provide a good standard of general or controlled ventilation (5 to 15 air changes per hour). Avoid carrying out activities involving exposure for more than 1 hour. Wear a respirator conforming to EN140 with Type AX filter or better. |
| Storage.General exposures (closed systems)with sample collection | Sample via a closed loop or other system to avoid exposure Provide a good standard of general or controlled ventilation (5 to 15 air changes per hour). Avoid carrying out activities involving exposure for more than 1 hour. , or: Wear a respirator conforming to EN140 with Type AX filter or better. |
| Section 2.2 | Control of Environmental Exposure |
| Substance is a unique structure. | |
| Non-hydrophobic. | |
| Readily biodegradable. | |
| Amounts Used | |
| Fraction of EU tonnage used in region: | 0,33 |
| Regional use tonnage (tonnes/year): | 4,95E+05 |
| Fraction of Regional tonnage used locally: | 1 |
| Annual site tonnage (tonnes/year): | 4,95E+05 |
| Maximum daily site tonnage (kg/day): | 1,65E+06 |

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

Version 1.1 Revision Date: 28.12.2023 SDS Number: 800010051827 Date of last issue: 06.11.2023
Print Date 04.01.2024

| | |
|---|----------|
| Frequency and Duration of Use | |
| Continuous release. | |
| Emission Days (days/year): | 300 |
| Environmental factors not influenced by risk management | |
| Local freshwater dilution factor: | 168 |
| Local marine water dilution factor: | 168 |
| Other Operational Conditions affecting Environmental Exposure | |
| Release fraction to air from process (initial release prior to RMM): | 1,1E-04 |
| Release fraction to wastewater from process (initial release prior to RMM): | 2,6E-04 |
| Release fraction to soil from process (initial release prior to RMM): | 0 |
| Technical conditions and measures at process level (source) to prevent release | |
| Common practices vary across sites thus conservative process re-release estimates used. | |
| Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil | |
| Prevent discharge of undissolved substance to or recover from onsite wastewater. | |
| Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of \geq (%) | 99,9 |
| Organisational measures to prevent/limit release from site | |
| Sludge should be incinerated, contained or reclaimed. | |
| Do not apply industrial sludge to natural soils. | |
| Conditions and Measures related to municipal sewage treatment plant | |
| Assumed domestic sewage treatment plant flow (m ³ /d) | 3,12E+04 |
| Conditions and Measures related to external treatment of waste for disposal | |
| During manufacturing no waste of the substance is generated. | |
| Conditions and measures related to external recovery of waste | |
| During manufacturing no waste of the substance is generated. | |

| | |
|---|----------------------------|
| SECTION 3 | EXPOSURE ESTIMATION |
| Section 3.1 - Health | |
| The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. For some of the Contributing Scenarios workplace exposures have been estimated from measured data. | |

| | |
|---------------------------------|--|
| Section 3.2 -Environment | |
| Used EUSES model. | |

| | |
|--|--|
| SECTION 4 | GUIDANCE TO CHECK COMPLIANCE WITH THE EXPOSURE SCENARIO |
| Section 4.1 - Health | |
| Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented. | |

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

| | | | |
|---------|----------------|--------------|--------------------------------|
| Version | Revision Date: | SDS Number: | Date of last issue: 06.11.2023 |
| 1.1 | 28.12.2023 | 800010051827 | Print Date 04.01.2024 |

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Section 4.2 -Environment

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.

Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination.

Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination.

Further details on scaling and control technologies are provided in SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>).

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

Version 1.1 Revision Date: 28.12.2023 SDS Number: 800010051827 Date of last issue: 06.11.2023
Print Date 04.01.2024

Exposure Scenario - Worker

| | |
|-------------------------|--|
| 300000000238 | |
| SECTION 1 | EXPOSURE SCENARIO TITLE |
| Title | Use as an intermediate- Industrial |
| Use Descriptor | Sector of Use: SU3, SU8 Process Categories: PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC15 Environmental Release Categories: ERC6a |
| Scope of process | Use of substance as an intermediate within closed or contained systems (not related to Strictly Controlled Conditions). Includes incidental exposures during recycling/recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (including marine vessel/barge, road/rail car and bulk container). |

| | |
|---|---|
| SECTION 2 | OPERATIONAL CONDITIONS AND RISK MANAGEMENT MEASURES |
| Section 2.1 | Control of Worker Exposure |
| Product Characteristics | |
| Physical form of product | Liquid, vapour pressure > 10 kPa at STP |
| Concentration of the Substance in Mixture/Article | Covers percentage substance in the product up to 100%, Unless stated otherwise., |
| Frequency and Duration of Use | |
| Covers daily exposures up to 8 hours (unless stated differently). | |
| Other Operational Conditions affecting Exposure | |
| Assumes activities are at ambient temperature (unless stated differently). Assumes a good basic standard of occupational hygiene is implemented. | |
| Contributing Scenarios | Risk Management Measures |
| General measures (carcinogens). | Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when there is potential for inhalation; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance. |

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

Version 1.1 Revision Date: 28.12.2023 SDS Number: 800010051827 Date of last issue: 06.11.2023
Print Date 04.01.2024

| | |
|---|---|
| General exposures (closed systems) | No other specific measures identified. |
| General exposures (closed systems)with sample collection | Sample via a closed loop or other system to avoid exposure Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Avoid carrying out activities involving exposure for more than 4 hours , or: Wear a respirator conforming to EN140 with Type AX filter or better. |
| General exposures (closed systems)Use in contained batch processeswith sample collection | Sample via a closed loop or other system to avoid exposure Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Avoid carrying out activities involving exposure for more than 1 hour. , or: Wear a respirator conforming to EN140 with Type AX filter or better. |
| Laboratory activities | Provide a good standard of general or controlled ventilation (5 to 15 air changes per hour). |
| Bulk closed loading and unloading.Road tanker/rail car loading.Marine vessel/barge (un)loading. | Use dry break couplings for material transfer. Wear a respirator conforming to EN140 with Type AX filter or better. Avoid carrying out activities involving exposure for more than 1 hour. |
| Equipment cleaning and maintenance | Drain down and flush system prior to equipment opening or maintenance. Retain drain downs in sealed storage pending disposal or for subsequent recycle. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Avoid carrying out activities involving exposure for more than 4 hours Wear a respirator conforming to EN140 with Type AX filter or better. |
| Storage.General exposures (closed systems)with sample collection | Sample via a closed loop or other system to avoid exposure Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Avoid carrying out activities involving exposure for more than 4 hours , or: Wear a respirator conforming to EN140 with Type AX filter or better. |
| Section 2.2 | Control of Environmental Exposure |
| Substance is a unique structure. | |
| Non-hydrophobic. | |

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

Version 1.1 Revision Date: 28.12.2023 SDS Number: 800010051827 Date of last issue: 06.11.2023
Print Date 04.01.2024

| | |
|---|---------|
| Readily biodegradable. | |
| Amounts Used | |
| Fraction of EU tonnage used in region: | 0,33 |
| Regional use tonnage (tonnes/year): | 7,5E+05 |
| Fraction of Regional tonnage used locally: | 0,069 |
| Annual site tonnage (tonnes/year): | 5,2E+04 |
| Maximum daily site tonnage (kg/day): | 1,7E+04 |
| Frequency and Duration of Use | |
| Continuous release. | |
| Emission Days (days/year): | 300 |
| Environmental factors not influenced by risk management | |
| Local freshwater dilution factor: | 168 |
| Local marine water dilution factor: | 168 |
| Other Operational Conditions affecting Environmental Exposure | |
| Release fraction to air from process (initial release prior to RMM): | 3,7E-05 |
| Release fraction to wastewater from process (initial release prior to RMM): | 7,0E-05 |
| Release fraction to soil from process (initial release prior to RMM): | 0 |
| Technical conditions and measures at process level (source) to prevent release | |
| Common practices vary across sites thus conservative process re-lease estimates used. | |
| Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil | |
| Prevent discharge of undissolved substance to or recover from onsite wastewater. | |
| Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of \geq (%) | 95 |
| Organisational measures to prevent/limit release from site | |
| Sludge should be incinerated, contained or reclaimed. | |
| Do not apply industrial sludge to natural soils. | |
| Conditions and Measures related to municipal sewage treatment plant | |
| Assumed domestic sewage treatment plant flow (m3/d) | 3,1E+04 |
| Conditions and Measures related to external treatment of waste for disposal | |
| External treatment and disposal of waste should comply with applicable local and/or regional regulations. | |
| Conditions and measures related to external recovery of waste | |
| External recovery and recycling of waste should comply with applicable local and/or regional regulations. | |

| | |
|---|----------------------------|
| SECTION 3 | EXPOSURE ESTIMATION |
| Section 3.1 - Health | |
| The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. For some of the Contributing Scenarios workplace exposures have been estimated from measured data. | |

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

Version 1.1 Revision Date: 28.12.2023 SDS Number: 800010051827 Date of last issue: 06.11.2023
Print Date 04.01.2024

Section 3.2 -Environment

Used EUSES model.

SECTION 4

GUIDANCE TO CHECK COMPLIANCE WITH THE EXPOSURE SCENARIO

Section 4.1 - Health

Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Section 4.2 -Environment

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.

Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination.

Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination.

Further details on scaling and control technologies are provided in SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>).

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

Version 1.1 Revision Date: 28.12.2023 SDS Number: 800010051827 Date of last issue: 06.11.2023
Print Date 04.01.2024

Exposure Scenario - Worker

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| 300000010710 | |
| SECTION 1 | EXPOSURE SCENARIO TITLE |
| Title | Distribution of substance- Industrial |
| Use Descriptor | Sector of Use: SU3, SU8 Process Categories: PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC9, PROC15 Environmental Release Categories: ERC2 |
| Scope of process | Loading (including marine vessel/barge, rail/road car and IBC loading) and repacking (including drums and small packs) of substance, including its sampling, storage, unloading distribution and associated laboratory activities. |

| | | |
|---|--|--------------------------|
| SECTION 2 | OPERATIONAL CONDITIONS AND RISK MANAGEMENT MEASURES | |
| Section 2.1 | Control of Worker Exposure | |
| Product Characteristics | | |
| Physical form of product | Liquid, vapour pressure > 10 kPa at STP | |
| Concentration of the Substance in Mixture/Article | Covers percentage substance in the product up to 100%., Unless stated otherwise., | |
| Frequency and Duration of Use | | |
| Covers daily exposures up to 8 hours (unless stated differently). | | |
| Other Operational Conditions affecting Exposure | | |
| Assumes a good basic standard of occupational hygiene is implemented. Assumes activities are at ambient temperature (unless stated differently). | | |
| Contributing Scenarios | | Risk Management Measures |
| General measures (carcinogens). | Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when there is potential for inhalation; clear up spills immediately and dispose of wastes safely.Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance. | |
| General exposures (closed systems) | No other specific measures identified. | |

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

Version 1.1 Revision Date: 28.12.2023 SDS Number: 800010051827 Date of last issue: 06.11.2023
Print Date 04.01.2024

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| Storage.General exposures (closed systems)with sample collection | Sample via a closed loop or other system to avoid exposure Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Avoid carrying out activities involving exposure for more than 4 hours Wear a respirator conforming to EN140 with Type AX filter or better. |
| General exposures (closed systems)Continuous processwith sample collection | Sample via a closed loop or other system to avoid exposure Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Avoid carrying out activities involving exposure for more than 1 hour. Wear a respirator conforming to EN140 with Type AX filter or better. |
| General exposures (closed systems)Batch processwith sample collection | Sample via a closed loop or other system to avoid exposure Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Avoid carrying out activities involving exposure for more than 15 minutes. Wear a respirator conforming to EN140 with Type AX filter or better. |
| Equipment cleaning and maintenance | Drain down and flush system prior to equipment opening or maintenance. Retain drain downs in sealed storage pending disposal or for subsequent recycle. Provide a good standard of general or controlled ventilation (5 to 15 air changes per hour). Wear a respirator conforming to EN140 with Type AX filter or better. |
| Bulk open loading and unloading.Road tanker/rail car loading.Marine vessel/barge (un)loading. | Use dry break couplings for material transfer. Wear a respirator conforming to EN140 with Type AX filter or better. Avoid carrying out activities involving exposure for more than 1 hour. |
| Drum and small package fillingwith local exhaust ventilation. | Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Avoid carrying out activities involving exposure for more than 1 hour. Wear a respirator conforming to EN140 with Type AX filter or better. |
| Laboratory activities | Handle in a fume cupboard or under extract ventilation. Provide a good standard of general or controlled ventilation (5 to 15 air changes per hour). |
| Section 2.2 | Control of Environmental Exposure |
| Substance is a unique structure. | |

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

Version 1.1 Revision Date: 28.12.2023 SDS Number: 800010051827 Date of last issue: 06.11.2023
Print Date 04.01.2024

| | |
|---|----------|
| Non-hydrophobic. | |
| Readily biodegradable. | |
| Amounts Used | |
| Fraction of EU tonnage used in region: | 0,33 |
| Regional use tonnage (tonnes/year): | 4,7E+05 |
| Fraction of Regional tonnage used locally: | 0,069 |
| Annual site tonnage (tonnes/year): | 3,33E+02 |
| Maximum daily site tonnage (kg/day): | 1,11E+03 |
| Frequency and Duration of Use | |
| Continuous release. | |
| Emission Days (days/year): | 300 |
| Environmental factors not influenced by risk management | |
| Local freshwater dilution factor: | 168 |
| Local marine water dilution factor: | 168 |
| Other Operational Conditions affecting Environmental Exposure | |
| Release fraction to air from process (initial release prior to RMM): | 1,1E-04 |
| Release fraction to wastewater from process (initial release prior to RMM): | 2,6E-04 |
| Release fraction to soil from process (initial release prior to RMM): | 0 |
| Technical conditions and measures at process level (source) to prevent release | |
| Common practices vary across sites thus conservative process re-lease estimates used. | |
| Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil | |
| Prevent discharge of undissolved substance to or recover from onsite wastewater. | |
| Treat air emission to provide a typical removal efficiency of (%) | 0 |
| Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of >= (%) | 95 |
| Organisational measures to prevent/limit release from site | |
| Sludge should be incinerated, contained or reclaimed. | |
| Do not apply industrial sludge to natural soils. | |
| Conditions and Measures related to municipal sewage treatment plant | |
| Assumed domestic sewage treatment plant flow (m3/d) | 3,1E+04 |
| Conditions and Measures related to external treatment of waste for disposal | |
| External treatment and disposal of waste should comply with applicable local and/or regional regulations. | |
| Conditions and measures related to external recovery of waste | |
| External recovery and recycling of waste should comply with applicable local and/or regional regulations. | |

| | |
|---|----------------------------|
| SECTION 3 | EXPOSURE ESTIMATION |
| Section 3.1 - Health | |
| The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated. For some of the Contributing Scenarios workplace exposures have been estimated from measured data. | |

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

Version 1.1 Revision Date: 28.12.2023 SDS Number: 800010051827 Date of last issue: 06.11.2023
Print Date 04.01.2024

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Section 3.2 -Environment

Used EUSES model.

SECTION 4

GUIDANCE TO CHECK COMPLIANCE WITH THE EXPOSURE SCENARIO

Section 4.1 - Health

Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented.

Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Section 4.2 -Environment

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.

Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination.

Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination.

Further details on scaling and control technologies are provided in SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>).

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

Version 1.1 Revision Date: 28.12.2023 SDS Number: 800010051827 Date of last issue: 06.11.2023
Print Date 04.01.2024

Exposure Scenario - Worker

300000000237

| SECTION 1 | EXPOSURE SCENARIO TITLE |
|------------------|---|
| Title | Polymer production- Industrial |
| Use Descriptor | Sector of Use: SU3, SU8 Process Categories: PROC1, PROC2, PROC3, PROC8a, PROC8b, PROC15 Environmental Release Categories: ERC 6C |
| Scope of process | Manufacture of polymers from monomers in continuous and batch processes. Including production, re-cycling and recovery, degassing, discharging, reactor maintenance and immediate polymer product formation (i.e. compounding, pelletisation, product off-gassing). |

| SECTION 2 | OPERATIONAL CONDITIONS AND RISK MANAGEMENT MEASURES |
|---|---|
| Section 2.1 | Control of Worker Exposure |
| Product Characteristics | |
| Physical form of product | Liquid, vapour pressure > 10 kPa at STP |
| Concentration of the Substance in Mixture/Article | Covers percentage substance in the product up to 100%., Unless stated otherwise., |
| Frequency and Duration of Use | |
| Covers daily exposures up to 8 hours (unless stated differently). | |
| Other Operational Conditions affecting Exposure | |
| Assumes a good basic standard of occupational hygiene is implemented. Assumes activities are at ambient temperature (unless stated differently). | |
| Contributing Scenarios | Risk Management Measures |
| General measures (carcinogens). | Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when there is potential for inhalation; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance. |
| General exposures (closed | Provide a good standard of general ventilation (not less than |

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

Version 1.1 Revision Date: 28.12.2023 SDS Number: 800010051827 Date of last issue: 06.11.2023
Print Date 04.01.2024

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| systems)Continuous process | 3 to 5 air changes per hour). |
| Bulk transferswith sample collection | Use dry break couplings for material transfer. , or: Wear a respirator conforming to EN140 with Type AX filter or better. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Avoid carrying out activities involving exposure for more than 15 minutes. |
| Polymerisation (bulk and batch)(closed systems)Continuous processwith sample collection | Sample via a closed loop or other system to avoid exposure Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Avoid carrying out activities involving exposure for more than 1 hour. , or: Wear a respirator conforming to EN140 with Type AX filter or better. |
| Polymerisation (bulk and batch)(closed systems)Batch processwith sample collection | Sample via a closed loop or other system to avoid exposure Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Avoid carrying out activities involving exposure for more than 1 hour. , or: Wear a respirator conforming to EN140 with Type AX filter or better. |
| Finishing operationsBatch processwith sample collection | Sample via a closed loop or other system to avoid exposure Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Avoid carrying out activities involving exposure for more than 1 hour. , or: Wear a respirator conforming to EN140 with Type AX filter or better. |
| Additivation and stabilisationwith sample collection | Sample via a closed loop or other system to avoid exposure Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Avoid carrying out activities involving exposure for more than 1 hour. , or: Wear a respirator conforming to EN140 with Type AX filter or better. |
| Laboratory activities | Handle in a fume cupboard or under extract ventilation. Provide a good standard of general or controlled ventilation (5 to 15 air changes per hour). |
| Equipment maintenance | Drain down and flush system prior to equipment opening or |

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

Version 1.1 Revision Date: 28.12.2023 SDS Number: 800010051827 Date of last issue: 06.11.2023
Print Date 04.01.2024

| | |
|---|---|
| | maintenance. Retain drain downs in sealed storage pending disposal or for subsequent recycle. Provide a good standard of general ventilation (not less than 3 to 5 air changes per hour). Wear a respirator conforming to EN140 with Type AX filter or better. |
| Section 2.2 | Control of Environmental Exposure |
| Substance is a unique structure. | |
| Non-hydrophobic. | |
| Readily biodegradable. | |
| Amounts Used | |
| Fraction of EU tonnage used in region: | 0,33 |
| Regional use tonnage (tonnes/year): | 7,5E+05 |
| Fraction of Regional tonnage used locally: | 0,069 |
| Annual site tonnage (tonnes/year): | 5,2E+04 |
| Maximum daily site tonnage (kg/day): | 1,72E+05 |
| Frequency and Duration of Use | |
| Continuous release. | |
| Emission Days (days/year): | 300 |
| Environmental factors not influenced by risk management | |
| Local freshwater dilution factor: | 168 |
| Local marine water dilution factor: | 168 |
| Other Operational Conditions affecting Environmental Exposure | |
| Release fraction to air from process (initial release prior to RMM): | 3,7E-05 |
| Release fraction to wastewater from process (initial release prior to RMM): | 7,0E-05 |
| Release fraction to soil from process (initial release prior to RMM): | 0 |
| Technical conditions and measures at process level (source) to prevent release | |
| Common practices vary across sites thus conservative process re-lease estimates used. | |
| Technical onsite conditions and measures to reduce or limit discharges, air emissions and releases to soil | |
| Prevent discharge of undissolved substance to or recover from onsite wastewater. | |
| Treat onsite wastewater (prior to receiving water discharge) to provide the required removal efficiency of >= (%) | 95 |
| Organisational measures to prevent/limit release from site | |
| Sludge should be incinerated, contained or reclaimed. | |
| Do not apply industrial sludge to natural soils. | |
| Conditions and Measures related to municipal sewage treatment plant | |
| Assumed domestic sewage treatment plant flow (m3/d) | 3,1E+04 |
| Conditions and Measures related to external treatment of waste for disposal | |
| External treatment and disposal of waste should comply with applicable local and/or regional regulations. | |
| Conditions and measures related to external recovery of waste | |
| External recovery and recycling of waste should comply with applicable local and/or regional | |

SAFETY DATA SHEET

According to EC No 1907/2006 as amended as at the date of this SDS

PROPYLENE OXIDE Sustainable

Version 1.1 Revision Date: 28.12.2023 SDS Number: 800010051827 Date of last issue: 06.11.2023
Print Date 04.01.2024

regulations.

SECTION 3 EXPOSURE ESTIMATION

Section 3.1 - Health

The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated.
For some of the Contributing Scenarios workplace exposures have been estimated from measured data.

Section 3.2 -Environment

Used EUSES model.

SECTION 4 GUIDANCE TO CHECK COMPLIANCE WITH THE EXPOSURE SCENARIO

Section 4.1 - Health

Predicted exposures are not expected to exceed the DN(M)EL when the Risk Management Measures/Operational Conditions outlined in Section 2 are implemented.
Where other Risk Management Measures/Operational Conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Section 4.2 -Environment

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures.

Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination.

Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination.

Further details on scaling and control technologies are provided in SpERC factsheet (<http://cefic.org/en/reach-for-industries-libraries.html>).