SIBUR-NEFTEKHIM JSC

SAFETY DATA SHEET

According to 1907/2006/EC (REACH), 1272/2008 (CLP) & 453/2010

ETHYLENE OXIDE

VERSION: 2.2
UPDATED: 01/03/2016

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

1.1 Product identifier

NAME OF SUBSTANCE:	ethylene oxide
SYNONYMS:	oxirane
TRADE NAMES:	ethylene oxide
Index No (CLP)	603-023-00-X
CAS #:	75-21-8
EC #:	200-849-9
REGISTRATION #:	01-2119432402-53-0256

1.2 Relevant identified uses of the substance

See Annex I

Most common technical function of substance: Intermediates.

Uses advised against

No uses advised against are identified.

1.3 Details of the supplier of the safety data sheet

SUPPLIER

Company name:	SIBUR-NEFTEKHIM JSC
Address:	390, Eastern Industrial area, Dzerzhinsk, Nizhniy Novgorod region, 606000, Russian Federation
Contact Telephone:	+7 8313 27-56-84
Fax:	+7 8313 27-59-99
Email Address:	infosnh@snh.sibur.ru
Emergency Telephone:	+7 8313 27-52-98 (office hours only, GMT+3)

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*)

ONLY REPRESENTATIVE

Company name:	Gazprom Marketing and Trading France
Address:	68 avenue des Champs-Elysées, Paris, 75008, France
Contact phone:	+33 1 42 99 73 50
Fax:	+33 1 42 99 73 99
Email address:	yury.severinchik@gazprom-mt.com

SECTION 2. HAZARDS IDENTIFICATION

2.1 Classification according to Regulation (EC) No 1272/2008 (CLP)

Physical/Chemical Hazards

Flam. Gas 1. H220: Extremely flammable gas.
Liquefied gas. H280: Contains gas under pressure; may explode if heated.
H230: May react explosively even in the absence of air.

Health Hazards

Acute Tox. 4. H302: Harmful if swallowed.
Acute Tox. 3. H331: Toxic if inhaled.
Skin Irrit. 2. H315: Causes skin irritation.
Eye Irrit. 2A. H319: Causes serious eye irritation.
Muta. 1B. H340: May cause genetic defects.
Carc. 1B. H350: May cause cancer.
STOT Single Exp. 3. H335: May cause respiratory irritation. Specific target organ toxicity - single (affected organs: respiratory system).
STOT Rep. Exp. 1. H372: Causes damage to organs through prolonged or repeated exposure. Specific target organ toxicity – repeated (affected organs: nervous system).

Environmental hazards

None

2.2 Labelling according to Regulation (EC) No 1272/2008 (CLP)

Signal word: Danger

Hazard pictogram

GHS02: flame

GHS04: gas cylinder

GHS08: health hazard

GHS06: skull and crossbones

2.3 Precautionary statements

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.
P261: Avoid breathing dust/fume/gas/mist/vapours/spray.
P264: Wash hands thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P271: Use only outdoors or in a well-ventilated area.
P280: Wear protective gloves/protective clothing/eye protection/face protection.
P281: Use personal protective equipment as required.
P308+P313: IF exposed or concerned: Get medical advice/ attention.
P361: Remove/Take off immediately all contaminated clothing.
P363: Wash contaminated clothing before reuse.
P362: Take off contaminated clothing and wash before reuse.
P377: Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381: Eliminate all ignition sources if safe to do so.
P410+P403: Protect from sunlight. Store in a well-ventilated place.
P301+P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.

P330: Rinse mouth.
P304+P340: IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
P312: Call a POISON CENTER or doctor/physician if you feel unwell.
P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337+P313: If eye irritation persists: Get medical advice/attention.
P302+352: IF ON SKIN: Wash with plenty of soap and water.
P332+P313 If skin irritation occurs: Get medical advice/ attention.
P403+P233: Store in a well-ventilated place. Keep container tightly closed.
P405: Store locked up.
P501: Dispose of absorbed material in accordance with regulations.

2.4 Other hazards

Assessment PBT / vPvB:
According to Annex XIII of Regulation (EC) No.1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH):
- not fulfilling PBT (persistent/bioaccumulative/toxic) criteria;
- not fulfilling vPvB (very persistent/very bioaccummulative) criteria.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Name EC No	EC No	CAS No	Content (w/w) %	Classification Regulation (EC) No 1272/2008 (CLP)
Ethylene oxide *Index No(CLP): 603-023-00-X*	200-849-9	75-21-8	99.9 −100.0	H220; H230; H280; H350; H340; H331; H302; H335; H315; H319; H372

Specific Conc. Limits (CLP): none.
M-factor: none.

The product does not contain impurities or additives that could affect product's labelling and classification according to Regulation (EC) No 1272/2008 (CLP) in the concentration ranges specified.

SECTION 4. FIRST-AID MEASURES

4.1 Description of first aid measures

General Advice
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.

If inhaled
Keep patient calm, remove to fresh air, seek medical attention. Immediately administer a corticosteroid from a controlled/metered dose inhaler.

Skin contact
Wash thoroughly with soap and water. Thaw out frostbites under cold liquid or water, do not rub affected parts of the body, apply sterile dressings, consult a skin specialist.

Contact with eyes
Immediately wash affected eyes for at least 15 minutes under running water with eyelids held open, consult an eye specialist.

Ingestion
Immediately rinse mouth and then drink 200-300 ml of water, seek medical attention.

4.2 Most important symptoms and effects, both acute and delayed
Symptoms: Overexposure may cause:, vomiting, convulsions, death, nausea, headache
Hazards: Symptoms can appear later.

4.3 Note to physician
Indication of any immediate medical attention and special treatment needed
Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote, administer corticosteroid dose aerosol to prevent pulmonary odema

SECTION 5. FIRE-FIGHTING MEASURES

5.1 Suitable Extinguishing media
Suitable extinguishing media: water spray, dry powder, alcohol-resistant foam, carbon dioxide

5.2 Unsuitable Extinguishing Media
None

5.3 Combustion Products
None

5.4 Specific hazards during fire fighting
Vapours may form explosive mixture with air.

5.5 Special protective equipment
Wear self-contained breathing apparatus and chemical-protective clothing.

5.6 Further information
Dispose of fire debris and contaminated extinguishing water in accordance with official regulations.
Cool endangered containers with water-spray.

SECTION 6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions
Breathing protection required. Avoid contact with the skin, eyes and clothing. Avoid skin contact with leaking liquid (danger of frostbite!).

6.2 Methods and material for containment and cleaning up
Suppress gases/vapours/mists with water spray jet. Dilute with plenty of water.

6.3 Environmental precautions
Discharge into the environment must be avoided. Suppress gases/vapours/mists with water spray jet. Retain and dispose of contaminated wash water.

6.4 Additional information
None

6.5 Reference to other sections
Information regarding exposure controls/personal protection and disposal considerations can be found in section 8 and 13.

SECTION 7. HANDLING AND STORAGE

7.1 Handling
Precautions for safe handling: 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.
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.

7.2 Storage
Further information on storage conditions: Keep container tightly closed and dry; store in a cool place. Protect against heat.

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

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters
8.1.1 Occupational Exposure Limits
For ethylene oxide (EC#200-849-9; CAS #75-21-8): International Limit Values[1)]

Country	LTEL 8 hr TWA ppm	LTEL 8 hr TWA mg/m^3	STEL ppm	STEL mg/m^3	Note
Austria	1	2	4	8	
Belgium	1	1.8			
Denmark	1	1.8	2	3.6	
Finland	1	1.8			
France	1		5		
Germany (AGS)	1 (1) 0.1 (2)	1 (1) 0.2 (2)	2 (1) (3)	4 (1) (3)	(1) Workplace exposure concentration corresponding to the proposed tolerable cancer risk. (see background document: Germany AGS). (2) Workplace exposure concentration corresponding to the proposed preliminary acceptable cancer risk. (see background document: Germany AGS). (3) 15 minutes average value.
Hungary				1.8	
Ireland	5	10			

Latvia		1			
People's Republic of China		2			
Poland		1			
Spain	1	1.8			
Sweden	1	2	5 (1)	9 (1)	(1) Short-term value, 15 minutes average value.
Switzerland	1	2			
The Netherlands		0.84			
United Kingdom	5	9.2			
1) GESTIS International Limit values: (http://limitvalue.ifa.dguv.de/)					

8.1.2 DNEL/ PNEC values

DN(M)ELs for workers

Route	Type of effect	Hazard conclusion	Most sensitive endpoint
Inhalation	Systemic effects - Long-term	DMEL: 2 mg/m³	carcinogenicity (By inhalation)
Inhalation	Systemic effects - Acute	DNEL: 10 mg/m³	neurotoxicity (By inhalation)
Inhalation	Local effects - Long-term	The systemic DNEL (see also chapter "Discussion" below) is considered to be protective also from local effects.	
Inhalation	Local effects - Acute	No-threshold effect and/or no dose-response information available.	
Dermal	Systemic effects - Long-term	No data available: testing technically not feasible.	
Dermal	Systemic effects - Acute	No data available: testing technically not feasible.	
Dermal	Local effects - Long-term	No data available: testing technically not feasible.	
Dermal	Local effects - Acute	No data available: testing technically not feasible.	

Further explanation on DNEL derivation for workers

Route / Type of effect	DNEL derivation	Assessment factors (AF) for DNEL derivation
Inhalation Systemic effects - Acute	Dose descriptor starting point: NOAEC	Overall Assessment Factor: 10

DN(M)ELs for the general population

For the general population no DNELs are proposed. No exposure via industrial processes should occur unless in the case of accidental release. For this scenario, however, meaningful values have already been designed elsewhere.

PNEC derivation for the environment

Compartment	Hazard conclusion	Remarks/Justification
Freshwater	PNEC aqua (freshwater): 0.084 mg/L	Assessment factor: 1000 Extrapolation method: assessment factor Only acute tests are available, the most sensitive EC50 value was measured with 84 mg/L for fish.
Marine water	PNEC aqua (marine water): 0.0084 mg/L	Assessment factor: 10000 Extrapolation method: assessment factor Justification based on the acute freshwater data.
Intermittent releases to water	PNEC aqua (intermittent releases): 0.84 mg/L	Assessment factor: 100 Extrapolation method: assessment factor Justification based on the acute freshwater data.
Sediments (freshwater)	PNEC sediment (freshwater): 0.329 mg/kg sediment dw	Extrapolation method: partition coefficient Calculated using equilibrium partitioning method (input parameters used: Koc value = 3.2 (calculated using KOCWIN v2.0 - MCI method, IUCLID chapter 5.4.1), PNECfreshwater = 0.084 mg/L).
Sediments (marine water)	PNEC sediment (marine water): 0.0329 mg/kg sediment dw	Extrapolation method: partition coefficient Calculated using equilibrium partitioning method (input parameters used: Koc value = 3.2 (calculated using KOCWIN v2.0 - MCI method, IUCLID chapter 5.4.1), PNECmarine water = 0.0084 mg/L).
Sewage treatment plant	PNEC STP: 13 mg/L	Assessment factor: 10 Extrapolation method: assessment factor Justification based on a EC10 of 130 mg/L measured in an KZA according to OECD 209 [BASF SE, 2009].
Soil	PNEC soil: 0.0165 mg/kg soil dw	Extrapolation method: partition coefficient Calculated using equilibrium partitioning method (input parameters used: Henry's law contant = 15 Pa*m3*mol-1(experimental database match in EPISuite, IUCLID chapter 5.4.2), Koc value = 3.2 (calculated using KOCWIN v2.0 - MCI method, IUCLID chapter 5.4.1), PNECwater = 0.084 mg/L).
Air	No hazard identified:	
Secondary poisoning		As the substance is not considered bioaccumulative, secondary poisoning is not a relevant exposure route. Hence, a respective assessment is not performed for this substance.

8.2 Exposure Controls

Personal protective equipment

Eye protection

Safety glasses with side-shields (frame goggles) (e.g. EN 166).

Respiratory protection
Self-contained breathing apparatus.

Hand protection
Suitable materials for short-term contact (recommended: At least protective index 2, corresponding > 30 minutes of permeation time according to EN 374) butyl rubber (butyl) - 0.7 mm coating thickness. Manufacturer's directions for use should be observed because of great diversity of types.
Supplementary note: The specifications are based on tests, literature data and information of glove manufacturers or are derived from similar substances by analogy. Due to many conditions (e.g. temperature) it must be considered, that the practical usage of a chemical-protective glove in practice may be much shorter than the permeation time determined through testing.

Skin and body protection
Body protection must be chosen depending on activity and possible exposure, e.g. apron, protecting boots, chemical-protection suit (according to EN 14605 in case of splashes or EN ISO 13982 in case of dust).

General safety and hygiene measures
Avoid contact with the skin, eyes and clothing. Avoid inhalation of vapour.

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

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Property	Value	Remarks
Physical state at 20°C and 101.3 kPa	Gaseous Colour: colourless Odour: sweetish, ethereal	
Melting / freezing point at 101.3 kPa	-111 °C	
Boiling point	10.7 °C at 1013 hPa	
Relative density	0.89 g/cm3 at 10 °C (liquid density at boiling point) 2.9 kg/m3 at 20 °C (gas density)	
Vapour pressure	1456 hPa at 20 °C	
Surface tension	Not surface active	In accordance with column 2 of REACH Annex VII, the surface tension of the substance does not need to be tested because due to its chemical structure, no surface activity is predicted.
Water solubility	Miscible in all proportions	
Partition coefficient n-octanol/water (log value)	-0.3 at 25 °C	

Flash point	Not applicable	Regardless of the substance being a gas at room temperature, and the flash point consequently being of no relevance under REACH, flash points of -57 to -17 °C are reported in the technical literature.
Flammability	Extremely flammable	The substance is not pyrophorice, and yields no flammable gases on contact with water. Given the flammability limits in air of 2.6 - 100 vol%, however, the substance is extrmely flammable. Aqueous solutions of ethylene oxide are flammable to highly flammable liquids, depending on the concentration.
Explosive properties	Explosive under the influence of a flame	The substances decomposes at 510 °C.
Autoflammability / self-ignition temperature at 1013 hPa	429 °C	
Oxidising properties	No oxidising properties	The Substance is incapable of reacting exothermically with combustible materials on the basis of the chemical structure. The substance is extremly flammable.
Granulometry	Not applicable	In accordance with column 2 of REACH Annex VII, the particle size distribution (Granulometrie) study does not need to be performed as the substance is marketed or used in a non solid or granular form.
Stability in organic solvents and identity of relevant degradation products	Not applicable	The stability of the substance is not considered as critical.
Dissociation constant	Not applicable	The substance does not contain any ionic structure.
Viscosity	Not applicable	Substance is a gas. Values of 0.00945 mPa_s at 20 °C (gas phase) and 0.254 mPa_s at 10 °C (liquid phase) are reported.

SECTION 10. STABILITY AND REACTIVITY

10.1 Chemical stability
The product is stable if stored and handled as prescribed/indicated.

10.2 Reactivity
No corrosive effect on metal.

10.3 Conditions to avoid
Avoid all sources of ignition: heat, sparks, open flame.

10.4 Materials to avoid
Acids, alkalies, metal oxides, amines, metal salts.

10.5 Possibility of hazardous reactions

Hazardous reactions in presence of mentioned substances to avoid. Strong exothermic reaction. Risk of polymerization.

10.6 Hazardous decomposition products
None

SECTION 11. TOXICOLOGICAL INFORMATION

	Conclusion / Remarks
Acute toxicity: **Acute oral toxicity** **Acute inhalation toxicity** **Acute dermal toxicity**	 Acute Tox. 4 (H302: Harmful if swallowed) LD50 (oral): 330 mg/kg bw (rat, male) Acute Tox. 3 (inhalation) LC50 (4 h, inhalation): 2.63 mg/L air (male) Not available
Skin irritation/corrosion	Irritating/ corrosion. Skin Irrit. 2 Rabbit, coverage: occlusive (shaved).
Skin sensitisation	Not available No testing is necessary, since the test substance is a mutagen and classified as genotoxic carcinogen. Rapid evaporization from skin.
Eye irritation	Irritating. Eye Irrit. 2A Rabbit, methods of Draize (1955) and Baldwin et al. (1973)
Respiratory irritation/ sensitisation	Not available
Repeated dose toxicity	Ethylene oxide may cause damage to the central and peripherous nervous system after repeated inhalation. Ethylene oxide can cause damage to blood-forming organs after repeated ingestion. According to Annex I, 3.9.2.1 of CLP a classification STOT RE Cat. 1 (H372) is warranted.

Toxicokinetics (basic toxicokinetics)
<u>Effects of EO (1200 ppm) on tissue GSH levels in the RAT:</u>
In initial experiments, groups of 4 male rats were exposed to EO at a chamber level of 1200 ppm for 4 hours. The only significant differences in relative organ weights between EO exposed rats and chamber controls was a 17% increase in stomach weight immediately after exposure and an 11% increase in brain weight and a 30% decrease in spleen weight 24 hours after exposure. No significant differences in tissue protein levels were observed. GSH levels were significantly decreased in all tissues examined, with the exception of blood. The most significantly affected tissues (and the % GSH depletion) were: liver (82%), lung (72%), stomach (72%) and testis (63%). GSH depletion in other tissues ranged from approximately 20-50%. Twenty-four hours after exposure, GSH levels were still depressed in bone marrow (33%) and testis (35%). However, in all other tissues, GSH levels had returned to control values or had "rebounded" to levels slightly above control. The tissue concentrations of oxidized glutathione (GSSG) were also measured (data not shown). Levels of GSSG were either unaffected or decreased (lung, testis and liver) after EO exposure. Oxidized glutathione

levels never increased in EO treated rats as would occur if GSH "depletion" was due to oxidation of GSH to GSSG.
Rats were exposed to 100, 600 or 1200 PPm E0 for 4 hours and GSH levels were measured in selected tissues immediately after exposure. GSH levels were compared to control rats and presented as a percent of respective control. At 100 ppm EO, GSH levels were significantly depressed by approximately 20% in lung, testis and liver. At 600 ppm and 1200 ppm, GSH in all tissues, except blood, was depleted. Although GSH depletion in all tissues was dose dependent, the relationship was not linear (i.e., there was a much steeper slope between 100-600 ppm than between 600-1200 ppm).
Effects of EO (900 ppm) of tissue GSH Levels in the MOUSE: four male mice per group were exposed to EO (900 ppm) or air in the inhalation desiccator. The only significant differences in relative organ weights between EO exposed mice and controls was a 39% decrease in spleen weight in E0 exposed animals 24 hours after exposure. No significant differences in tissue protein levels were observed. In all tissues, except kidney, GSH levels were significantly depleted immediately after termination of exposure. Consistent with the rat data, the most significantly affected tissues in mice (and the % GSH depletion) were: lung (86%), liver (85%) and stomach (69%). Unlike the rat, mouse testicular GSH levels were less affected (39% depletion) while GSH was depleted to a greater extent in the heart (69% depletion) and blood (71% depletion). Twenty-four hours after exposure, GSH levels were still below control levels in the blood and testis while levels rebounded above controls in the lung. Oxidized glutathione (GSSG) levels were unaffected in the kidney, stomach and spleen of E0 exposed mice immediately after exposure while depletion occurred in other tissues (ranging from 29% in the brain to 86% in the lung).

Mutagenicity	Genetic toxicity: positive. Muta. 1B
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 Bominant lethal assay (chromosome aberration) rat, mouse /inhalation
Carcinogenicity	Ethylene oxide is classified as Muta. 1B
in vitro studies	Positive Experimental result Bacterial reverse mutation assay (e.g. Ames test, gene mutation) mammalian cell gene mutation assay (gene mutation)
in vivo studies	Positive Experimental result Dominant lethal assay (chromosome aberration), rat and mouse/ inhalation
Toxicity for reproduction **Developmental toxicity**	NOAEC (rat, inhalation: vapour): 0.054 mg/L air (overall effects) NOAEC (maternal toxicity/rabbit/inhalation: vapour): 0.27 mg/L air (overall effects) NOAEC (teratogenicity/rabbit/inhalation: vapour): 0.27 mg/L air (overall effects)

SECTION 12. ECOLOGICAL INFORMATION

Aquatic toxicity	
Aquatic invertebrates: **Short-term toxicity to aquatic invertebrates** (*Daphnia magna*) **Long-term toxicity to aquatic invertebrates**	LC50 (48 h): ca. 137 — 300 mg/L test mat. (nominal) With high probability acutely not harmful to aquatic invertebrates. Not available The hazard assessment of ethylene oxide reveals neither a need to classify the substance as dangerous for the environment, nor is it a PBT or vPvB substance, nor are there any further indications that the substance may be hazardous to the environment. Therefore a long-term toxicity study in aquatic invertebrates is not provided.
Algae and aquatic plants *Selenastrum capricornutum (new name: Pseudokirchnerella subcapitata)* (algae)	EC50 (96 h): 240 mg/L test mat. based on: growth rate With high probability acutely not harmful to aquatic algae
Short term toxicity testing on fish (*Pimephales promelas*)	LC50 (96 h): 84 mg/L test mat. (nominal)
Long term toxicity testing on fish	Not available The hazard assessment of ethylene oxide reveals neither a need to classify the substance as dangerous for the environment, nor is it a PBT or vPvB substance, nor are there any further indications that the substance may be hazardous to the environment. Therefore, and for reasons of animal welfare, a long-term toxicity study in fish is not provided
Toxicity to sediment organisms	Not available. The test substance is not supposed to be directly applied to sediment and an indirect exposure to sediment is unlikely since the substance is readily biodegradable. For substances being considered as „readily biodegradable“, it can be assumed that they will be biologically degraded within the STP-process.
Terrestrial toxicity	
Toxicity to soil macro-organisms	Not available. The test substance is not supposed to be directly applied to soil and an indirect exposure to soil via sewage sludge transfer is unlikely since the substance is readily biodegradable. For a substance being considered as „readily biodegradable“, it can be assumed that it will be biodegraded within the STP process and as a consequence a transfer to the soil compartment is not expected. Therefore, no tests on terrestrial organisms are provided.

Toxicity to terrestrial plants	Not available. The test substance is not supposed to be directly applied to soil and an indirect exposure to soil via sewage sludge transfer is unlikely since the substance is readily biodegradable. For a substance being considered as „readily biodegradable“, it can be assumed that it will be biodegraded within the STP process and as a consequence a transfer to the soil compartment is not expected. Therefore, no tests on terrestrial organisms are provided.
Toxicity on soil microorganism:	Not available. The test substance is not supposed to be directly applied to soil and an indirect exposure to soil via sewage sludge transfer is unlikely since the substance is readily biodegradable. For a substance being considered as „readily biodegradable“, it can be assumed that it will be biodegraded within the STP process and as a consequence a transfer to the soil compartment is not expected. Therefore, no tests on terrestrial organisms are provided.
Microbiological activity in sewage treatment systems: toxicity to aquatic micro-organisms	EC10 (180 min): 130 mg/L test mat. (nominal) based on: respiration rate EC50 (180 min): > 713 mg/L test mat. (nominal) based on: respiration rate The inhibition of the degradation activity of activated sludge is not anticipated when introduced in appropriate low concentrations.
Toxicity to birds	Not available. The substance is not bioaccumulative. Therefore, and because of reasons of animal welfare, no study on toxicity in birds is performed.
Adsorption / desorption	Adsorption coefficient Koc: 1.435 log Koc: 0.157 Based upon a calculated log Koc adsorption to solid soil phase is not expected. Ethylene oxide will slowly evaporate from the water surface into the atmosphere. Ethylene oxide will preferentially distribute into the compartments water and air. Percent distribution in media: Air (%): 7.75; Water (%): 92.23; Soil (%): 0; Sediment (%): 0
Biotic degradation	Ethylene oxide is readily biodegradable according to OECD criteria
Abiotic degradation	Half-life (DT50): t1/2 (pH 7.4): 12.1 d at 25 °C In contact with water ethylene oxide will hydrolyse slowly. Ethylene oxide is readily biodegradable. Therefore biodegradation seems to be the main degradation pathway and hydrolyses is of minor importance.
Biodegradation Biodegradation in water and sediment	Readily biodegradable (according to OECD criteria).

Biodegradation in soil	Degradation of test substance: 69% after 20 d (O_2 consumption) Substance is readily biodegradable
Phototransformation/photolysis Phototransformation in air Phototransformation in water	 Half-life (DT50): 57.2 d (25 °C) After evaporation or exposure to the air, the product will be slowly degraded by photochemical processes. Readily biodegradable
Aquatic/ Terrestrial bioaccumulation	Regarding the 1-octanol/water partition coefficient, accumulation of the test substance in organisms is not to be expected
PBT/vPvB	Ethylene oxide is neither a PBT nor a vPvB substance.

SECTION 13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Incinerate in suitable incineration plant, observing local authority regulations

13.2 Local Legislation

EU Waste Disposal Code (EWC): 16 05 04* gases in pressure containers (including halons) containing dangerous substances.
EPA Hazardous. Waste Number: U115 (Ethylene oxide. Toxic (Non-Acute) Hazardous Waste).

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.

SECTION 14. TRANSPORT INFORMATION

14.1 Land transport (ADR/RID)

ID number:	UN 1040
Chemical name	Ethylene Oxide
Hazard class:	2
Packing group:	None
Packing Instruction:	P200
Hazard label:	2.3; 2.1
Classification code	2TF
Hazard identification No.:	263
Special Provisions	None
Tunnel restriction code:	B/D

14.2 Marine transport (IMDG)

ID number:	UN 1040
Chemical name	Ethylene Oxide
Hazard class:	2.3
Packing group:	None
Packing Instruction:	P200
EmS Number 1:	FD
EmS Number 2:	SU

Labels:	2.3; 2.1
Marine pollutant:	No
Special Provisions	None

Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code
Not applicable.

14.3 Air transport (IATA/ICAO)

ID number:	UN 1040
Chemical name	Ethylene Oxide
Hazard class:	2.3
Labels:	2.3; 2.1
Packing Instruction:	P200

SECTION 15. REGULATORY INFORMATION

15.1 EU regulations
Authorisations: Not applicable.
Restrictions on use: Not applicable.

15.2 Chemical Safety Assessment
Chemical Safety Report has been developed for ethylene oxide.
APPENDIX II to the e-SDS: Exposure scenarios.

15.3 Key literature references and sources
Documents, provided by consortium REEC: chemical safety report (CAS 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 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 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorization and Restriction of Chemicals (REACH).

DIRECTIVE 1999/45/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 31 May 1999 concerning the approximation of the laws, regulations and administrative provisions of the Member States relating to the classification, packaging and labelling of dangerous preparations.

Directive 67/548/EEC on the approximation of the laws, regulations and administrative provisions relating to the classification, packaging and labeling of dangerous substances.

COMMISSION DECISION of 16 January 2001 amending Decision 2000/532/EC as regards the list of wastes (notified under document number (2001/118/EC).

NATIONAL REGULATIONS (GERMANY)
Major Accident Hazard Legislation 82/501/EWG.

MARPOL 73/78 International Convention for the Prevention of Pollution from Ships, 1973 Protocol of 1978 relating to the International Convention for the Prevention of Pollution from Ships, 1973.

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.

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)
BOULV	Binding Occupational Exposure Limit Values
BCF	Bioconcentration factor
DFG	Germany Research Foundation
DNEL	Derived No Effect Level
ErC50	Means EC50 in terms of reduction of growth rate
EC50	Half effective concentration; the molarity of an agonist that produces 50% of the maximal possible effect of that agonist
ErL50 and EbL50	Are defined as the effective loading rate of the test substance that reduced growth rate and biomass, respectively, by 50% as compared with the control
IOELV	Indicative Occupational Exposure Limit Values
IMDG	International Maritime Dangerous Goods
ICAO-TI	Technical Instructions for the Safe Transport of Dangerous Goods by Air
K_{oc}	Adsorption coefficient
Kow	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 *(USA CDC)*
NOEC	No Observed Effect Concentration
NOAEL	No Observed Adverse Effect Level
OECD	Organization for Economic Co-operation and Development
OSHA	Occupational Safety & Health Administration *(USA)*
PEC	Predicted No Effect Concentration
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
STEL	Short Term Exposure Limit

STOT	Specific Target Organ Toxicity
(STOT) RE	Repeated Exposure
(STOT) SE	Single Exposure
TWA	Time Weighted Average
UN	United Nations

16.3 List of ES (exposure scenario) given in Annex I to the extended SDS

Manufacture and distribution of ethylene oxide (M1)

Use as a laboratory agent (M-4)

Polymer production (IW-2)

Use as an intermediate (IW-3)

Use as a laboratory agent (PW-4)

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 I

Relevant identified uses of the substance

Manufacture

Identifiers	Use descriptors
M-1: Manufacture and distribution of ethylene oxide	**Environmental release category (ERC):** ERC 1: Manufacture of substances **Process category (PROC):** PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing)
M-4: Use as a laboratory agent	**Environmental release category (ERC):** ERC 1: Manufacture of substances **Process category (PROC):** PROC 15: Use as laboratory reagent

Uses at industrial sites

Identifiers	Use descriptors	Other information
IW-2: Polymer produciton	**Environmental release category (ERC):** ERC 6c: Industrial use of monomers for manufacture of thermoplastics **Process category (PROC):** PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) **Sector of end use:** SU 9: Manufacture of fine chemicals SU 8: Manufacture of bulk, large scale chemicals (including petroleum products) **Technical function of the substance during formulation:** Intermediates	Subsequent service life relevant for that use: no
IW-3: Use as an intermediate	**Environmental release category (ERC):** ERC 6a: Industrial use resulting in manufacture of another substance (use of intermediates)	Subsequent service life relevant for that use: no

Identifiers	Use descriptors	Other information
	Process category (PROC): PROC 1: Use in closed process, no likelihood of exposure PROC 2: Use in closed, continuous process with occasional controlled exposure PROC 3: Use in closed batch process (synthesis or formulation) PROC 8b: Transfer of substance or preparation (charging/discharging) from/to vessels/large containers at dedicated facilities PROC 9: Transfer of substance or preparation into small containers (dedicated filling line, including weighing) **Sector of end use:** SU 8: Manufacture of bulk, large scale chemicals (including petroleum products) SU 9: Manufacture of fine chemicals **Technical function of the substance during formulation:** Intermediates	

Uses by professional workers

Identifiers	Use descriptors	Other information
PW-4: Use as a laboratory agent	**Environmental release category (ERC):** ERC 1: Manufacture of substances **Process category (PROC):** PROC 15: Use as laboratory reagent **Technical function of the substance during formulation:** Intermediates	Subsequent service life relevant for that use: no

END OF SDS