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

1.1. Product identifier

Product form: Substance
Trade name: EnviroSystems™ Ethylene Oxide Sterilant
Product code: PB013, PB015 (SDS No. A500)

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

1.2.1. Relevant identified uses

Industrial/Professional use spec: Product for industrial use only
Use of the substance/mixture : Antimicrobial agent

1.2.2. Uses advised against

No additional information available.

1.3. Details of the supplier of the safety data sheet

Manufacturer:
STERIS Corporation
P. O. Box 147, St. Louis, MO 63166, US
Telephone Number for Information: 1-800-444-9009 (Customer Service-Scientific Products)
US Emergency Telephone No. 1-314-535-1395 (STERIS); 1-800-424-9300 (CHEMTREC)
Email: asksteris_msdse@steris.com

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

GHS-US Classification
Flam. Gas 1 H220
Press. Gas H280
Carc. 1B H350
Mutagen 1B H340
Acute Tox. 3 (Inhalation) H331
Acute Tox. 4 (Oral) H302
Skin Irrit. 2 H315
Eye Irrit. 2A H319
STOT SE 3 H335

Full text of H-phrases: see Section 16.

2.2. Label elements – This label is regulated by the EPA under FIFRA. Refer to Section 15.

GHS-US labelling
Hazard pictograms (GHS-US): GHS03 GHS05 GHS07 GHS08

Signal word (GHS-US): Danger
Hazard statements (GHS-US): H220 - Extremely flammable gas
H280 - Contains gas under pressure; may explode if heated
H302 - Harmful if swallowed
H315 - Causes skin irritation
H319 - Causes serious eye irritation
H331 - Toxic if inhaled
H335 - May cause respiratory irritation
H340 - May cause genetic defects
H350 - May cause cancer

Precautionary statements (GHS-US):
P201 - Obtain special instructions before use.
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P261 - Avoid breathing dust/fume/gas/mist/vapours/spray.
P264 - Wash hands thoroughly after handling.
Envirosystems™ Ethylene Oxide Sterilant
Safety Data Sheet
according Federal Register/Vol. 77, No. 58 /Monday, March 28, 2012/Rules and Regulation

P270 - Do not eat, drink or smoke when using this product.
P271 - Use only outdoors or in a well-ventilated area.
P281 - Use personal protective equipment as required.
P301 + P312 - IF SWALLOWED: Call a POISON CENTER/ doctor if you feel unwell.
P302 + P352 - IF ON SKIN: Wash with plenty of water.
P304 + P340 - IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313 - IF exposed or concerned: Get medical advice/ attention.
P312 - Call a POISON CENTER/doctor if you feel unwell.
P330 - Rinse mouth.
P332 + P313 - If skin irritation occurs: Get medical advice/attention.
P337 + P313 - If eye irritation persists: Get medical advice/attention.
P362 - Take off contaminated clothing.
P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381 - In case of leakage, eliminate all ignition sources.
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed.
P405 - Store locked up.
P410 + P403 - Protect from sunlight. Store in a well-ventilated place.
P501 - Dispose of contents/container to comply with applicable local, national and international regulation.

2.3. Other hazards
No additional information available.

SECTION 3: Composition/information on ingredients

3.1. Substance
Not applicable.

3.2. Mixture

<table>
<thead>
<tr>
<th>Name</th>
<th>Product identifier</th>
<th>%</th>
<th>GHS-US Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethylene Oxide</td>
<td>(CAS No) 75-21-8 (EC no) 200-849-9</td>
<td>100</td>
<td>Refer to Section 2.1</td>
</tr>
</tbody>
</table>

Full text of H-phrases: see Section 16.

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general: Never give anything by mouth to an unconscious person. In all cases of doubt, or when symptoms persist, seek medical attention.

First-aid measures after inhalation: Remove to fresh air and keep at rest in a position comfortable for breathing. If not breathing, give artificial respiration. Immediately get medical attention.

First-aid measures after skin contact: Remove contaminated clothing immediately. Immediately flush skin with plenty of water for at least 15 minutes. If skin irritation occurs: Get medical advice/attention. Treat for possible cryogenic injury if needed by warming affected areas with tepid water. Wash contaminated clothing before reuse. Discard contaminated leather articles such as shoes and belts.

First-aid measures after eye contact: In case of contact with eyes flush immediately with plenty of flowing water for 10 to 15 minutes holding eyelids apart and consult an ophthalmologist. Immediately get medical attention. Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor/physician. Never wear contact lenses when working with ethylene oxide.

First-aid measures after ingestion: If victim completely conscious/alert give water or milk if the person is fully conscious. Rinse mouth. Do NOT induce vomiting. Obtain emergency medical attention. Call a POISON CENTER/doctor/physician if you feel unwell.

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

Symptoms/injuries after inhalation: May cause respiratory irritation of nose and throat, nausea, vomiting. Medical observation is recommended for 24 to 48 hours after overexposure, as pulmonary edema and respiratory effects may be delayed.

Symptoms/injuries after skin contact: Causes skin irritation.

Symptoms/injuries after eye contact: Causes serious eye irritation.

Symptoms/injuries after ingestion: Swallowing this material will result in serious health hazard.

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

No additional information available.
SECTION 5: Firefighting measures

5.1. Extinguishing media


Unsuitable extinguishing media: No information.

5.2. Special hazards arising from the substance or mixture

Hazardous decomposition products in case of fire: May form explosive mixtures with air. Highly reactive.

5.3. Advice for firefighters

Firefighting instructions: Ethylene oxide is dangerously explosive under fire conditions and burns in the absence of oxygen. Liquid ethylene oxide is lighter than water and vapors are heavier than air and may travel along ground long distances to sources of ignition and then flash back. Keep upwind. Stop flow of gas if without risk, while continuously cooling containers with water. Do not extinguish flames unless flow is stopped, since explosive re-ignition can occur.

Protective equipment for firefighters: Use self-contained breathing apparatus (SCBA) operated in pressure-demand mode, chemical resistant clothing. Do not enter fire area without proper protective equipment, including respiratory protection.

Other information: Danger! Extremely Flammable liquid and gas under pressure. Vapors are extremely flammable and are readily ignited by static charge, sparks and flames at concentrations above 2.6%.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures: Treat any ethylene oxide leak as an emergency.

6.1.1. For non-emergency personnel

Protective equipment: Use self-contained breathing apparatus (SCBA) operated in pressure-demand mode, chemical resistant clothing.

Emergency procedures: Stop leak if safe to do so. Evacuate unnecessary personnel.

6.1.2. For emergency responders

Protective equipment: Use self-contained breathing apparatus (SCBA) operated in pressure-demand mode, chemical resistant clothing.

Emergency procedures: Stop leak if safe to do so. Evacuate unnecessary personnel.

6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters. Avoid release to the environment.

6.3. Methods and material for containment and cleaning up

Methods for cleaning up: Spill should be handled by trained cleaning personnel properly equipped with respiratory and eye protection. Eliminate all ignition sources. Use water to dilute material. Contain any spills with dikes or absorbents to prevent migration and entry into sewers or streams. Soak up spills with inert solids, such as clay or diatomaceous earth as soon as possible. Comply with applicable local, national and international regulation.

6.4. Reference to other sections

See Heading 8. Exposure controls and personal protection.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling: Read label before use. Avoid all eye and skin contact and do not breathe vapor and mist. Keep away from incompatible materials. Use only in a well-ventilated area.

Hygiene measures: Take care for general good hygiene and housekeeping. Wash hands thoroughly after handling. Contaminated clothing should be washed thoroughly in order to eliminate a delayed potential fire hazard. Do not eat, drink or smoke when using this product.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures: Provide adequate ventilation. A washing facility/water for eye and skin cleaning purposes should be present.

Storage conditions: Keep only in the original container in a cool, dry, well-ventilated place. Keep container tightly closed.

Incompatible materials: Amines, ammonia, water, acids, bases, metal chlorides, metal oxides, metallic potassium, mercaptans, alcohols, oxidizers and many other organic and inorganic materials.
Prohibitions on mixed storage: Keep away from incompatible materials.
Storage area: Store in dry, cool, well-ventilated area.

7.3. Specific end use(s)
No additional information available.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

<table>
<thead>
<tr>
<th>Ethylene Oxide (75-21-8)</th>
<th>ACGIH (TWA 8 hr.) (ppm)</th>
<th>1 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA - ACGIH</td>
<td>US IDLH (ppm)</td>
<td>800 ppm</td>
</tr>
<tr>
<td>USA - OSHA</td>
<td>OSHA PEL (TWA 8 hr.) (ppm)</td>
<td>1.0 ppm (0.5 ppm action level)</td>
</tr>
<tr>
<td>USA - OSHA</td>
<td>OSHA PEL (STEL 15 min.) (ppm)</td>
<td>5 ppm</td>
</tr>
</tbody>
</table>

8.2. Exposure controls

Appropriate engineering controls: Ensure adequate ventilation with explosion proof system. Electrical devices used in areas handling ethylene oxide must be engineered and designed to the applicable fire codes. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Local exhaust ventilation is recommended to maintain vapor level below the threshold limit value (TLV).

Personal protective equipment: Personal protective equipment should be selected based upon the conditions under which this product is handled or used. Protective clothing. Gloves. Protective goggles. Avoid all unnecessary exposure.

Hand protection: Wear protective gloves. Use neoprene gloves. Use gloves constructed of chemical resistant materials such as heavy nitrile rubber if frequent or prolonged contact is expected.

Eye protection: Wear protective eyewear. Eye protection, including both chemical splash goggles and face shield, must be worn when possibility exists for eye contact due to spraying liquid or airborne particles. Do not wear contact lenses.

Skin and body protection: Wear suitable protective clothing. Rubber apron, boots.

Respiratory protection: Work in well-ventilated zones or use proper respiratory protection. Wear appropriate mask or SCBA under emergency situations. Protection factors vary depending upon the type of respirator used.

Other information: Do not eat, drink or smoke during use.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state: Liquid
Appearance: Clear
Color: Colorless
Odor: Sweet ether-like
Odor threshold: 261 ppm-detectable; 500-700 ppm recognizable
pH: 7
Evaporation rate: 100% volatile by volume
Melting point: -169°F (-112°C)
Freezing point: -169°F (-112°C)
Boiling point: 50.7°F (-10.4°C)
Flash point: Tag Closed Cup: <0°F (< -18°C)
Auto-ignition temperature: 833°F (445°C); Burns in absence of air.
Decomposition temperature: ~932°F (~773 K)
Flammability (solid, gas): Flammable
Vapor pressure: 1095 mm Hg @ 20°C
Relative vapor density at 20°C: No data available
Relative density: 0.875 @ 20°C
Envirosystems™ Ethylene Oxide Sterilant
Safety Data Sheet
according Federal Register/Vol. 77, No. 58 /Monday, March 28, 2012/Rules and Regulation

9.2. Other information
No additional information available.

SECTION 10: Stability and reactivity

10.1. Reactivity
Not reactive under normal conditions. Under abnormal conditions (for example external heating, contamination), thermal decomposition and runaway polymerization can occur and may lead to explosion.

10.2. Chemical stability
Material is stable for extended periods in closed airtight, pressurized containers at room temperature, under normal storage and handling conditions. Vapors may explode when exposed to common ignition sources. In the presence of catalysts, polymerization and decomposition of liquid may occur and is accelerated at temperatures above 800°F (426°C).

10.3. Possibility of hazardous reactions
Dangerous exothermic polymerization reaction can occur when ethylene oxide is contaminated or heated.

10.4. Conditions to avoid
Avoid storage at warm temperatures [around 100°F (38°C)] in order to prevent polymerization. Do not store at temperatures above 125°F (52°C) under any circumstances. Avoid contact of ethylene oxide with incompatible materials to avoid highly exothermic polymerization reaction. Prevent exposure to all sources of ignition such as heat, flame, lighted tobacco products or electrical or mechanical sparks.

10.5. Incompatible materials
Amines, ammonia, water, acids, bases, metal chlorides, metal oxides, metallic potassium, mercaptans, alcohols, oxidizers and many other organic and inorganic materials.

10.6. Hazardous decomposition products
Carbon monoxide and carbon dioxide gases.

SECTION 11: Toxicological information

11.1. Information on toxicological effects
Acute toxicity : Harmful if inhaled or swallowed.

<table>
<thead>
<tr>
<th>Ethylene Oxide (75-21-8)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LD50 oral rat</td>
<td>330 mg/kg, rat</td>
</tr>
<tr>
<td>LD50 dermal rat</td>
<td>Not available</td>
</tr>
<tr>
<td>LD50 dermal rabbit</td>
<td>Not available</td>
</tr>
<tr>
<td>LC50 inhalation rat (mg/l)</td>
<td>5748 ppm (male rat) 4439 ppm (female rat) 5029 ppm (rat - combined sexes)</td>
</tr>
<tr>
<td>ATE (oral)</td>
<td>Not available</td>
</tr>
<tr>
<td>ATE (dermal)</td>
<td>Not available</td>
</tr>
<tr>
<td>ATE (gases)</td>
<td>Not available</td>
</tr>
<tr>
<td>ATE (vapors)</td>
<td>Not available</td>
</tr>
<tr>
<td>ATE (dust,mist)</td>
<td>Not available</td>
</tr>
</tbody>
</table>

Skin corrosion/irritation : Causes skin irritation.

Serious eye damage/irritation : Causes serious eye irritation.

Respiratory or skin sensitisation : Not classified

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

Germ cell mutagenicity : While ethylene oxide has demonstrated, in epidemiological studies with exposed workers, an increased incidence of chromosomal aberrations and sister chromatid exchanges, the relevance of such effects to human health hazard evaluation is currently uncertain.

Carcinogenicity : NIOSH reported no overall elevated risk for any type of cancer or other diseases as compared to the general population, however, among those workers with very high ethylene oxide exposure (combination of exposure level and years worked); there was evidence of an elevated risk for blood cancers among men and breast cancer among women.
Reproductive toxicity : Not classified
Based on available data, the classification criteria are not met.
Some limited epidemiological data suggests that women exposed to ethylene oxide have a greater incidence of miscarriage.

Specific target organ toxicity (single exposure) : Overexposure to this product may affect the skin, eyes, respiratory system, liver, kidneys, brain, blood, reproductive system and central nervous system.

Specific target organ toxicity (repeated exposure) : If ingested, may cause anemia, gastrointestinal irritation, effects on liver, kidneys, and adrenal glands.

Aspiration hazard : In the unlikely route of ingestion, aspiration may occur during swallowing or vomiting, resulting in lung damage.

Potential Adverse human health effects and symptoms : Harmful if swallowed.

SECTION 12: Ecological information

12.1. Toxicity
Ecology - water : Based on available data, the classification criteria are not met.

<table>
<thead>
<tr>
<th>Ethylene Oxide (75-21-8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LC50 fishes 1</td>
</tr>
<tr>
<td>LC50 Daphnia 1</td>
</tr>
<tr>
<td>LC50 invertebrate</td>
</tr>
</tbody>
</table>

12.2. Persistence and degradability

<table>
<thead>
<tr>
<th>Ethylene Oxide (75-21-8)</th>
</tr>
</thead>
</table>

12.3. Bioaccumulative potential

<table>
<thead>
<tr>
<th>Ethylene Oxide (75-21-8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioaccumulative potential</td>
</tr>
</tbody>
</table>

12.4. Mobility in soil
EO does not readily absorb into sediments or soils

12.5. Results of PBT and vPvB assessment
No additional information available.

12.6. Other adverse effects
No additional information available.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations : WASTE MANAGEMENT/DISPOSAL: When disposed, ethylene oxide is a RCRA hazardous waste with waste code U115 (Commercial chemical product - listed for toxicity and ignitability). Waste ethylene oxide may be incinerated in an approved hazardous waste incinerator or can be biologically treated in an approved facility. DO NOT INCINERATE ANY ETHYLENE OXIDE CONTAINERS. Ethylene oxide is banned from land disposal. Dispose of waste materials in accordance with all applicable Federal, State and local laws and regulations.

CONTAINER DISPOSAL: Nonrefillable container. Do not reuse or refill this container. Aerate empty cartridges according to instructions in equipment manual. After aeration, dispose of with normal non-incinerated waste.

Do not contaminate food, feed, or water by storage or disposal.

PESTICIDE DISPOSAL:
Do not puncture unused cartridges. Pesticide wastes are acutely hazardous. Improper disposal of excess pesticide is a violation of Federal law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency or the Hazardous Waste Representative at the nearest EPA Regional Office for guidance.
Envirosystems™ Ethylene Oxide Sterilant
Safety Data Sheet

Ecology - waste materials: Avoid release to the environment.

SECTION 14: Transport information

In accordance with DOT

<table>
<thead>
<tr>
<th>Transport document description (Ground-US Only)</th>
<th>UN 1040, Ethylene Oxide, 2.3 (2.1) Inhalation Hazard Zone D, DOT-SP11265 (DOT-SP11265 relieves STERIS from labeling the case as a Toxic for US domestic transport only.)</th>
</tr>
</thead>
</table>
Proper Shipping Name                          | Ethylene Oxide                                                                                                                                   |
UN-No.(DOT)                                    | UN1040                                                                                                                                             |
Department of Transportation (DOT) Hazard Classes | 2.3 (2.1)                                                                                                                                         |
Packing Group                                  | Not applicable.                                                                                                                                   |

Transport document description (Ground-Outside US)

| Proper Shipping Name                          | Ethylene Oxide                                                                                                                                   |
| UN-No.                                        | UN1040                                                                                                                                             |
| Hazard Classes                                | 2.3 (2.1)                                                                                                                                           |
Packing Group                                  | Not applicable.                                                                                                                                   |

Additional information

Other information: 

Road/Rail transport

Class: ADR/RID

| UN 1040, Ethylene Oxide, 2.3 (2.1) Toxic, Flammable Gas, Classification Code 2TF, Hazard Identification No. 263 |

Sea transport

Class: IMDG

| UN 1040, Ethylene Oxide, 2.3 (2.1) Marine Pollutant: No |

Air transport

Class: ICAO/IATA

| Forbidden. This product cannot be shipped by air. |

SECTION 15: Regulatory information

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

EPA FIFRA Pesticide Product Notice

This chemical is a pesticide product registered by the United States Environmental Protection Agency and is subject to certain labeling requirements under federal pesticide law. These requirements differ from the classification criteria and hazard information required for safety data sheets (SDS), and for workplace labels of non-pesticide chemicals. The hazard information required on the pesticide label is reproduced below. The pesticide label also includes other important information, including directions for use.

EPA FIFRA Signal Word

Danger

EPA FIFRA Hazard Statements

Keep Out of Reach of Children
Extremely Flammable
Do not use near fire or flame.
Store at room temperature.

EPA FIFRA Precautionary Statements

Hazards to Humans and Domestic Animals
Causes eye and skin burns.
Harmful if inhaled.
May cause nervous system damage.
Do not breathe vapor.
Do not swallow.
Do not get in eyes, on skin, or on clothing.
Store and use adequate ventilation in accordance with 29 CFR 1910:1047.

15.2. Chemical safety assessment

No chemical safety assessment has been carried out.

SECTION 16: Other information

Revision Date: 08/13/2015
Envirosystems™ Ethylene Oxide Sterilant Safety Data Sheet

Other information: CERCLA: Section 103: Reportable Quantity – 10 lb (40 CFR 302.4)

Full text H-phrases:

| Acute Tox. 3 (Inhalation) | Acute toxicity (inhalation), Category 3 |
| Acute Tox. 4 (Oral)       | Acute toxicity (oral), Category 4       |
| Carc. 1B                  | Carcinogen, Category 1B                |
| Eye Irrit. 2A             | Causes serious eye irritation, Category 2A |
| Flam. Gas 1               | Flammable gas, Category 1              |
| Mutagen 1B                | Mutagen, Category 1B                   |
| Press. Gas                | Pressurized Gas                        |
| Skin Irrit. 2             | Skin corrosion/irritation, Category 2   |
| STOT SE 3                 | Specific target organ toxicity (single exposure), Category 3 |
| H220                      | Extremely flammable gas                |
| H280                      | Contains gas under pressure; may explode if heated |
| H302                      | Harmful if swallowed                   |
| H315                      | Causes skin irritation                 |
| H319                      | H319 Causes serious eye irritation     |
| H331                      | Toxic if inhaled                       |
| H335                      | May cause respiratory irritation       |
| H340                      | May cause genetic defects (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard). |
| H350                      | May cause cancer (state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard). |

NFPA health hazard: 4-Very short exposure could cause death or major residual injury

NFPA fire hazard: 4-Will rapidly or completely vaporize at normal atmospheric pressure and temperature, or is readily dispersed in air and will burn readily

NFPA reactivity: 3-Capable of detonation or explosive decomposition but requires a strong initiating source, must be heated under confinement before initiation, reacts explosively with water, or will detonate if severely shocked

GHS SDS

The information on this sheet is not a specification and does not guarantee specific properties. The information is intended to provide general knowledge as to health and safety based upon our knowledge of the handling, storage and use of the product. It is not applicable to unusual or non-standard uses of the product or where instruction or recommendations are not followed.