Ethylene Oxide
Product Stewardship Summary
(CAS number 75-21-8)

Chemical Formula for Ethylene Oxide
C₂H₄O

What is Ethylene Oxide?

Ethylene Oxide (EO) is a colourless, highly reactive and extremely flammable product. The boiling point is 12°C and therefore it is a gas at room temperature. The flammability range is 2.6 to 100 vol% in air. EO is produced by direct oxidation of ethylene with oxygen. The product is stored and transported under nitrogen pressure. Because EO reacts readily with many chemicals, it is one of the most versatile intermediates and is used to produce many derivative products.

How is Ethylene Oxide Used?

Shell Chemicals only sells EO to industrial users who use it as a building block for the manufacture of a versatile range of derivative products. Ethylene oxide is used in the production of:

- Ethylene glycols (used in antifreeze, polyester for fibres, polyethylene terephthalate (PET) bottles and containers, gas dehydration, heat transfer liquids and solvent);
- Poly(ethylene) glycols (used in cosmetics, pharmaceutical preparations, lubricants, paint solvents and plasticisers);
- Ethylene oxide-based glycol ethers (used in brake fluids, detergents and paint and lacquer solvents);
- Ethanolamines (used in soaps, detergents, natural gas purification and textile finishing);
- Ethoxylated products of starches and fatty alcohols (used in detergents, surfactants, emulsifiers and dispersants).

Shell Chemicals does not sell to customers that use EO in the sterilisation market or as a component in weapon applications; nor allow the repackaging or distribution of EO beyond the buyer’s destination.

Health, Safety and Environmental Considerations

EO is classified as a gas under pressure and in its gas form, EO is highly reactive and extremely flammable. 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 mixture can occur. EO is stable at room temperature and not sensitive against shock or friction but due to impurities like water, or rust, it tends to polymerize violently. Ethylene
Oxide easily penetrates through clothing and footwear, causing skin irritation and dermatitis, with the (delayed) formation of blisters.

EO is classified as a human carcinogen, a mutagen and can cause damage to reproductive organs. EO is classified as acutely toxic if inhaled or ingested. Liquid EO evaporates rapidly and can cause freezing of the skin. It is also highly irritating to the eyes and skin and even in dilute solutions can cause blistering or severe damage to the skin or eyes.

EO is may cause irritation to the respiratory system. Repeated exposure to EO can cause damage to organs and the nervous system.

The American Conference of Governmental Industrial Hygienists (ACGIH) has assigned an eight-hour occupational exposure limit of 1 part per million (1ppm). EO does not have good warning properties through smell.

Releases of EO liquid or vapour do not persist in the environment. EO has low to moderate aquatic toxicity, is biodegradable and will not bioaccumulate.

As EO can be used as a pesticide, the export of EO is controlled by the Rotterdam Convention or PIC regulations.

As ethylene oxide is solely used as an intermediate for the production of other products, consumer exposure is not expected. As such, the risks associated with the product are judged to be low.

Storing and Transporting Ethylene Oxide

EO is transported in the US by rail car to customers and by pipeline to internal users. In Europe, it is transported by tank truck, rail car, pipeline and on cross channel ferry. EO is supplied to customers from Singapore via pipeline.

Ethylene Oxide is stored and/or transported as a liquid under moderate pressure. Hose connections are done preferably by dry-break coupling.

During the loading/unloading procedure, those involved should wear personal protective equipment, including adequate protection for the respiratory tract.

Risk Characterization Summary

Risks associated with exposure to this product have been evaluated for the following “chain-of-commerce” activities: manufacture, storage, product transfer, transportation, and customers/markets. Due to health, safety and environmental considerations, it is only manufactured, stored and transported to customers in closed systems. Likewise, customers are limited to those who only use the product in closed systems as an intermediate for the manufacture of other chemicals. Proper equipment design and handling procedures maintain low risk from exposure to the product where the product is used as a chemical intermediate.

This product stewardship summary is intended to give general information about Ethylene Oxide. It is not intended to provide an in-depth discussion of health and safety information. Additional information is available through the chemical’s applicable Safety Data Sheet, which should be
consulted before use of the chemical. This product stewardship summary does not supplant or replace required regulatory and/or legal communication documents.