Product Safety Assessment

DOW™ Pentaethylene Glycol

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Names
• CAS No. 4792-15-8
• Pentaethylene glycol
• PentaEG
• DOW™ pentaethylene glycol
• DOW pentaEG
• DOW pentaethylene glycol crude SCO
• DOW crude pentaEG

Product Overview
• DOW™ pentaethylene glycol is a co-product of the ethylene glycol manufacturing process and is a mixture of higher molecular weight ethylene glycols. This mixture, also called DOW crude pentaEG, is the liquid that remains after the removal of mono-, di-, and triethylene glycols by distillation. It is primarily made up of tetraethylene and pentaethylene glycols. DOW pentaethylene glycol is a black viscous liquid with an obnoxious odor.¹,² For further details, see Product Description.
• Mixtures of pentaethylene glycol are processed into brake fluids and used in manufacturing of polyester resins. They are also used as aids in cement grinding.³ For further details, see Product Uses.
• Occupational exposure to pentaethylene glycol is possible at ethylene glycol production facilities and facilities using pentaethylene glycol (e.g., facilities that manufacture or use brake fluids). Exposure may be minimized through engineering controls and the use of personal protective equipment. For further details, see Exposure Potential.
• Eye contact with pentaethylene glycol may cause transient irritation. Prolonged skin contact is not likely to cause irritation, but may cause drying or flaking of the skin. At room temperature, exposure to vapor is minimal due to low volatility. Vapor from heated material may cause adverse effects.⁴ For further details, see Health Information.
• DOW pentaethylene glycol is stable under recommended storage conditions. Exposure to elevated temperatures can cause this material to decompose. Avoid contact with strong acids, strong bases, and strong oxidizers.⁵ For further details, see Physical Hazard Information.

Manufacture of Product
• Manufacturing Sites – Dow, along with its subsidiaries and affiliates, is a large global producer of ethylene glycols, including pentaethylene glycol. Dow manufactures ethylene glycol

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glycols at facilities in St. Charles, Louisiana, U.S.; Seadrift, Texas, U.S.; and Wilton, United Kingdom.

- **Process** – Water is added to ethylene oxide at high temperature and pressure. The resulting product is a blend of mono-, di-, and triethylene glycols and higher molecular weight glycols. The mixed glycols are passed through evaporators and drying towers to remove excess water, and are then separated by high-vacuum distillation. Tetraethylene glycol and pentaethylene glycol are the major components in the still bottoms stream after removing the more volatile mono-, di-, and triethylene glycols. The chemical reaction is as follows:

\[
\begin{align*}
\text{Ethylene Oxide} + \text{Water} & \rightarrow \text{Ethylene Glycol} \\
\text{Ethylene Oxide} + \text{Ethylene Glycol} & \rightarrow \text{Diethylene Glycol} \\
\text{Ethylene Oxide} + \text{Diethylene Glycol} & \rightarrow \text{Triethylene Glycol} \\
\text{Ethylene Oxide} + \text{Triethylene Glycol} & \rightarrow \text{Tetraethylene Glycol} \\
\text{Ethylene Oxide} + \text{Tetraethylene Glycol} & \rightarrow \text{Pentaethylene Glycol}
\end{align*}
\]

**Product Description**

DOW™ pentaethylene glycol is a co-product of the ethylene glycol manufacturing process and is a mixture of higher molecular weight ethylene glycols. It is a black viscous liquid with an obnoxious odor. DOW pentaethylene glycol has the following typical composition ranges: 20–80% pentaEG (CAS No. 4792-15-8), 20–85% tetraEG (CAS No. 112-60-7), 2–15% hexaethylene glycol (CAS No. 2615-15-8), less than or equal to 10% triethylene glycol (CAS No. 112-27-6), less than or equal to 5% diethylene glycol (CAS No. 111-46-6), and less than or equal to 3% polyethyleneglycols (CAS No. 25322-68-3). Dow does not manufacture pentaEG in pure form. The ethylene glycols are liquids of low volatility and high water solubility.
Product Uses

Mixtures of pentaethylene glycol products are processed into brake fluids, and used in the manufacturing of polyester resins. They are also used as aids in cement grinding, as well as for other industrial applications.

Exposure Potential

Pentaethylene glycol is used in the production of industrial and consumer products. Based on these uses, the public could be exposed through:

- **Workplace exposure** – Ethylene glycols are manufactured in closed systems using engineering controls that prevent the escape of liquid or vapors and minimize the potential for release to the environment. Chance of exposure may be further reduced through the use of personal protective equipment. Occupational exposure is possible at ethylene glycol production facilities and at facilities using pentaethylene glycol (e.g., facilities that manufacture or use brake fluids). Facilities that manufacture or use pentaethylene glycol should have a thorough safety training program for employees and appropriate work processes and safety equipment in place to limit exposure. See Health Information.

- **Consumer exposure to pentaethylene glycol** – Most uses of tetra- and pentaethylene glycols occur in industrial settings. However, some consumer brake fluids may contain pentaethylene glycol. See Health Information.

- **Environmental releases** – In the event of a spill, the focus is on containing the spill to prevent contamination of soil and surface or ground water. For small spills, clean up with absorbent material such as cat litter, sand, sawdust, vermiculite, or Zorb-all. Collect in suitable and properly labeled containers. See Environmental, Health, and Physical Hazard Information.

- **Large release** – Industrial spills or releases are infrequent and generally contained. If a large spill does occur, isolate the area. Dike the area to contain the spill. Pump spilled material into suitable and properly labeled containers. Use appropriate safety equipment. See Environmental and Physical Hazard Information.

- **In case of fire** – Isolate the fire and deny entry. Firefighters should wear positive-pressure, self-contained breathing apparatus and protective firefighting clothing and should fight the fire from a safe distance. Use water fog or fine spray, dry-chemical or carbon-dioxide fire extinguishers, or foam. Alcohol-resistant ATC foams are preferred if available. Do not use a direct water stream as it may spread the fire. See Physical Hazard Information.

For more information, request the relevant Safety Data Sheet from the Dow Customer Information Group.

Health Information

**Eye and Skin Contact** – Eye contact with pentaethylene glycol may cause transient irritation. Prolonged skin contact is not likely to cause significant irritation, but may cause drying or flaking of the skin. The response may be more severe if the skin is scratched or cut. Prolonged skin contact is not likely to result in absorption of harmful amounts. Massive contact with damaged skin, or material sufficiently hot to burn the skin, may result in absorption of potentially lethal amounts.
Inhalation – At room temperature, exposure to pentaethylene glycol vapor is minimal due to low volatility. Inhalation of pentaethylene glycol mist may cause irritation of the nose and throat. Vapor from heated material may cause adverse effects.

Ingestion – In humans, pentaethylene glycol is expected to be moderately toxic if swallowed, even though oral toxicity was low when tested in animals. Swallowing amounts incidental to normal handling operations is not likely to cause injury; however, swallowing larger amounts may cause serious injury, even death.

Repeated exposure – For the majority of components, repeated excessive exposure may cause irritation to the upper respiratory tract (nose and throat). In humans, only data for repeated excessive exposure to diethylene glycol have been reported, and these data show effects on the kidneys and gastrointestinal tract.

For more information, request the relevant Safety Data Sheet from the Dow Customer Information Group.

Environmental Information

The components of DOW™ pentaethylene glycol are not expected to accumulate in the food chain (bioconcentration potential is low). Their potential for mobility in soil is high. Although tetraethylene glycol cannot be considered to be readily biodegradable, di- and triethylene glycol are readily biodegradable. Polyethylene glycol is expected to be readily biodegradable.

Based on ecotoxicity test results, pentaethylene glycol is practically nontoxic to fish on an acute basis (exposure to a single, large amount).

For more information, request the relevant Safety Data Sheet from the Dow Customer Information Group.

Physical Hazard Information

DOW™ pentaethylene glycol is stable under recommended storage conditions. Exposure to elevated temperatures can cause the product to decompose. Generation of gas can cause pressure build-up in closed systems. Decomposition products depend upon temperature, air supply, and the presence of other materials and can include aldehydes, alcohols, ethers, and other compounds.

Avoid contact with strong acids, strong bases, and strong oxidizers.

For more information, request the relevant Safety Data Sheet from the Dow Customer Information Group.

Regulatory Information

Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of DOW™ pentaethylene glycol. These regulations may vary by city, state, country, or geographic region. Information may be found by requesting the relevant Safety Data Sheet from the Dow Customer Information Group.
Additional Information

- Safety Data Sheet (request from the Dow Customer Information Group at: http://www.dow.com/assistance/dowcig.htm)
- Dow Customer Information group (http://www.dow.com/assistance/dowcig.htm)
- “Ethylene Glycol Category,” SIDS Initial Assessment Profile – Summary Conclusions of the SIAR, CA/ICCA website (http://www.jetoc.or.jp/HP_SIDS/pdffiles/107-21-1.pdf)


References

10 Estimates by The Dow Chemical Company.
NOTICES:

As part of its 2015 Sustainability Goals, Dow has committed to make publicly available safety assessments for its products globally. This product safety assessment is intended to give general information about the chemical (or categories of chemicals) addressed. It is not intended to provide an in-depth discussion of health and safety information. Additional information is available through the relevant Safety Data Sheet, which should be consulted before use of the chemical. This product safety assessment does not replace required communication documents such as the Safety Data Sheet.

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