Product Safety Assessment

**Triethylene Glycol Monomethyl Ether (Methoxytriglycol)**

Select a Topic:

- Names
- Product Overview
- Manufacture of Product
- Product Description
- Product Uses
- Exposure Potential
- Health Information
- Environmental Information
- Physical Hazard Information
- Regulatory Information
- Additional Information
- References

### Names
- CAS No. 112-35-6
- Methoxytriglycol
- Triethylene glycol monomethyl ether
- 2-(2-(2-methoxyethoxy)ethoxy)ethanol
- Ethanol,2-[2-(2-methoxyethoxy)ethoxy]
- TGME

### Product Overview
- Methoxytriglycol, or triethylene glycol monomethyl ether (TGME), is a colorless liquid with a pungent odor produced by The Dow Chemical Company. This solvent is completely soluble in water and has low volatility (doesn’t evaporate easily).
- The major use of TGME is in automotive hydraulic brake fluid formulations. Other possible uses include: dye carrier for textile dye processes, chemical process solvent and intermediate, coupling agent for resins and dyes in water-based printing inks, and solvent in household and industrial cleaning formulations, paint and floor polish strippers, hard surface cleaners, and disinfectants.
- High boiling glycol ethers such as TGME are manufactured and stored in closed systems. The formulation of TGME into brake fluids is done in closed systems in an industrial setting. The greatest worker exposure potential exists in automotive plants and brake service/repair shops using TGME-containing hydraulic brake fluids. Consumer exposure could occur when car owners top off their brake master cylinders from a container of fluid and spill some liquid, or through the use of household cleaning formulations.
- Eye contact with TGME may cause slight irritation and/or slight temporary corneal injury. Prolonged skin contact is not likely to cause significant irritation, or result in absorption of harmful amounts. Inhalation of TGME is not expected to cause adverse effects.
- TGME is stable under recommended storage conditions. Avoid contact with strong acids, strong bases, and strong oxidizers.

### Manufacture of Product
- **Capacity** – Dow is the world’s largest producer of ethylene-oxide-based glycol ethers. In 2002, global consumption of E-series glycol ethers, including TGME, was 606,000 metric tons (1,336 million pounds). Global consumption of TGME 14,000 metric tons (31 million pounds) in 2002. Dow has glycol ether production facilities in the following U.S. locations:
Midland, Michigan; Hahnville‡ and Plaquemine, Louisiana; and Seadrift†, Texas. Dow also has production facilities in San Lorenzo, Argentina and Stade, Germany.

- **Process** – TGME is produced in a closed system process as a by-product from the manufacture of lighter (mono- and di-) ethylene glycol monomethyl ethers. Ethylene oxide and methanol react in the presence of a catalyst to produce a mixture of mono-, di-, tri-, and other heavy ethylene glycol monomethyl ethers. The products are separated by distillation.9

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\begin{align*}
3 \text{H}_2\text{C} &-\text{CH}_2 + \text{CH}_3\text{OH} \rightarrow \text{HOCH}_2\text{CH}_2\text{OCH}_2\text{CH}_2\text{OCH}_2\text{CH}_2\text{OCH}_3
\end{align*}
\]

Ethylene oxide Methanol Methoxytriglycol

**Product Description**10

TGME is a colorless liquid with a pungent odor and very low volatility. It is completely soluble in water.

TGME contains greater than 90% triethylene glycol monomethyl ether. Minor chemical components are tetraethylene glycol monomethyl ether and diethylene glycol monomethyl ether.

**Product Uses**11,12,13

TGME is used for a wide variety of applications. The main commercial uses for TGME made by Dow are:

- Chemical process solvent and intermediate for making esters used as solvents, surfactants, and plasticizers
- Mining applications
- Other miscellaneous uses

Household products which may contain TGME are: hard surface cleaners, disinfectants, paint or floor polish strippers, and automotive brake fluid.

**Exposure Potential**

Based on the uses for TGME, the public could be exposed through:

- **Workplace exposure**14 – The use of enclosed equipment, engineering controls, and personal protective equipment during the manufacture of TGME minimizes the opportunity for human contact. Worker exposure during hydraulic brake fluid formulation is low due to the fact it is a closed-system process. Those working with TGME in manufacturing operations could be exposed during maintenance, sampling, testing, or other procedures. The greatest TGME exposure potential exists in automotive plants and brake service/repair shops where brake lines and cylinders are filled. Workplace exposure could also occur in facilities using the material to manufacture other products or in the textile industry during the fabric dyeing process. Each facility should have a thorough training program for employees, appropriate

‡ Site of Union Carbide Corporation, a wholly owned subsidiary of The Dow Chemical Company
work processes, and safety equipment in place to limit unnecessary exposure. See Health Information.

- **Consumer exposure to products containing TGME** – The public could be exposed to this material when car owners top off their brake master cylinders with brake fluid, or through the use of household cleaners, disinfectants, and paint or floor polish strippers containing TGME. Wear safety glasses. Even though chemical gloves should not be needed when handling TGME, commercial products may have other ingredients that require protective clothing, gloves, or other precautions such as adequate ventilation. Read and follow product instructions carefully to minimize the risk of exposure. See Health Information.

- **Environmental releases** – In the event of a spill, the focus is on containing the spill to prevent contamination of soil, surface or ground water. For small spills, absorb TGME with materials such as sand or vermiculite. Collect in suitable and properly labeled containers. See Environmental, Health and Physical Hazard Information.

- **Large release** – For large spills, contain spilled material if possible. Isolate area. Pump into suitable and properly labeled containers. Keep unnecessary personnel from entering area. Use appropriate safety equipment. Follow emergency procedures carefully. In case of fire, do not use direct water stream. Use dry chemical fire extinguisher, water fog or fine spray. Alcohol resistant foams (ATC type) are preferred. See Environmental, Health and Physical Hazard Information.

For more information, see the relevant Safety Data Sheet (SDS).

**Back to top**

**Health Information**

Eye contact with TGME may cause slight irritation and/or slight temporary corneal injury. Prolonged skin contact is not likely to cause significant irritation, or result in absorption of harmful amounts. Inhalation of TGME is not expected to cause adverse effects. The material has a very low toxicity if swallowed.

In animals, effects after ingestion have been reported on the testes at a very high-dose levels.

TGME did not cause birth defects in animals. It is toxic to the fetus in lab animals at doses toxic to the mother.

In vitro genetic toxicity studies were negative. Animal genetic toxicity studies were negative.

For more information, see the relevant SDS.

**Back to top**

**Environmental Information**

TGMEs bioconcentration potential is low. The potential for mobility in soil is very high: prevent from entering into soil, ditches, sewers, waterways, and/or groundwater. TGME is readily biodegradable and practically non-toxic to aquatic organisms. The material is not expected to accumulate in the food chain.

For more information, see the relevant SDS.

**Back to top**

**Physical Hazard Information**

TGME is stable under recommended storage conditions. Store in carbon steel, stainless steel, or phenolic-lined steel drums. Do not store in aluminum, copper, galvanized iron, galvanized steel, Viton, Neoprene, Nitrile, or natural rubber. Storage Period: **Bulk** 6 - Months; **Steel drums** - 18 Months. Spills...
of these organic materials on hot fibrous insulations may lead to lowering of the auto-ignition temperatures possibly resulting in spontaneous combustion.

Do not distill to dryness. This material can oxidize at elevated temperatures causing pressure build-up in closed systems. Avoid contact with strong acids, strong bases, and strong oxidizers. Decomposition products depend upon temperature, air supply, and the presence of other materials. These products can include and are not limited to aldehydes, ketones, and organic acids.

For more information, see the relevant Safety Data Sheet (SDS).

Regulatory Information
Regulations may exist that govern the manufacture, sale, transportation, use and/or disposal of TGME. These regulations may vary by city, state, country or geographic region. Information may be found by consulting the relevant SDS or Contact Us.

Additional Information
- Safety Data Sheet (http://www.dow.com/webapps/msds/msdssearch.asp)
- Contact Us (http://www.dow.com/oxysolvents/contact/index.htm)

For more business information about TGME, visit Dow’s Oxygenated Solvents web site. (http://www.dow.com/oxysolvents/)

References
13 Estimates by The Dow Chemical Company.

Back to top
NOTICES:

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