Product Safety Assessment
DOW™ Ethylene Glycol-Based Low Temperature Thermal Fluids

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Names
- CAS No. 107-21-1
- DOWTHERM™ SR-1 Heat Transfer Fluids
- DOWTHERM IG Heat Transfer Fluids
- UCARTHERM™ Heat Transfer Fluids
- AMBITROL™ CN Coolants
- Ethylene glycol
- DOWTHERM 4000 Heat Transfer Fluids
- DOWCAL™ 10 Heat Transfer Fluids
- NORKOOL™ SLH Coolants
- AMBITROL FL Coolants

Product Overview
- DOW™ ethylene glycol-based low temperature thermal fluids are mixtures of ethylene glycol with water, corrosion and scale inhibitors, and dyes. They are marketed by Dow under the trade names AMBITROL™ Coolants, NORKOOL™ Coolants, UCARTHERM™ Heat Transfer Fluids, DOWTHERM™ Heat Transfer Fluids, and DOWCAL™ Heat Transfer Fluids. For further details, see Product Description.
- These products are widely used for secondary cooling and heating applications, for freeze and burst protection of pipes, and for various defrosting and dehumidifying applications. For further details, see Product Uses.
- According to generally accepted guidelines, ethylene glycol has moderate toxicity if ingested. Following acute oral ingestion, humans are much more sensitive to the toxic effects of ethylene glycol than are animals.¹ For further details, see Health Information.
- Occupational exposure is possible because the products are used in a variety of industrial heating and cooling operations. Consumer contact is unlikely. For further details, see Exposure Potential.
- Ethylene glycol is readily biodegradable. Its bioconcentration potential (tendency to accumulate in the food chain) is low, and its potential for mobility in soil is very high. It is not classified as dangerous to aquatic organisms.² For further details, see Environmental Information.
- DOW ethylene glycol-based low temperature thermal fluids are thermally stable at recommended storage and use temperatures. Extreme temperatures can result in decomposition and pressure build-up in closed systems. Ethylene glycol is incompatible with strong acids, strong bases, and strong oxidizers.² For further details, see Physical Hazard Information or the relevant Safety Data Sheet.
Manufacture of Product

- **Capacity**: Total global production capacity of ethylene glycol was reported to be 19.6 million metric tons (43 billion pounds) in 2006. Actual consumption in 2006 was reported to be 17.0 million metric tons (37.5 billion pounds). Dow production facilities are located in St. Charles, Louisiana; Seadrift, Texas; Wilton, United Kingdom; and Terneuzen, The Netherlands. Additional production facilities of MEGlobal (a joint venture between Petrochemical Industries Company (PIC) of Kuwait and The Dow Chemical Company) are located at Fort Saskatchewan and Red Deer, Alberta.

- **Process**: Ethylene glycol is manufactured by a closed, single reactor process using a catalyzed condensation reaction between ethylene oxide and a controlled amount of water as shown below. Higher glycols (di-, tri-, and tetraethylene glycol) are by-products. Ethylene glycol is then separated and purified by distillation.

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H2C=CH2 + HO → CH3CH2OH + HO
O
Water (excess)
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Product Description

Ethylene glycol is a colorless, odorless liquid. It is soluble to some extent in a wide range of organic materials and is completely soluble in water. DOW™ ethylene glycol-based low temperature thermal fluids are mixtures of ethylene glycol with water, corrosion and scale inhibitors, and dyes. Dyes promote easy detection of system leaks. The specially formulated corrosion inhibitor packages provide protection for metals commonly used in heat transfer systems. Ethylene glycol-based fluids generally provide superior heat transfer efficiency and excellent low temperature performance and are preferred for most heat transfer applications. The amount of glycol in a particular solution directly affects the optimum temperature range and performance of the fluid.

Product Uses

Solutions of DOW™ ethylene glycol-based low temperature thermal fluids are widely used for secondary cooling and heating applications, for freeze and burst protection of pipes, and for various deicing, defrosting, and dehumidifying applications. Specific applications for these fluids include:

- HVAC (heating, ventilation and air conditioning) systems freeze/burst/corrosion protection
- Cold room dehumidifying
- Refrigeration coil defrosting
- Process cooling and heating
- Conveyor roller defrosting
- Ice skating rinks
- Air preheating
- Liquefied Natural Gas (LNG) re-gasification
Closed-loop process cooling and heating for the manufacture of pharmaceutical products
- Waste heat recovery
- Sidewalk snow melting systems
- Solar heating
- Refrigeration warehouse floor heating

Exposure Potential

DOW™ ethylene glycol-based low temperature thermal fluids are used in the production of industrial and consumer products. Based on the uses for ethylene glycol-based thermal fluids, the public could be exposed through:

- **Workplace exposure** – Exposure can occur either in an ethylene glycol manufacturing or formulating facility or in the various industrial or manufacturing facilities that use these products as heat transfer fluids. Those working with ethylene glycol in manufacturing operations could be exposed during maintenance, sampling, testing, or other procedures. Each manufacturing facility should have a thorough training program for employees and appropriate work processes and safety equipment in place to limit unnecessary ethylene glycol exposure. See Health Information.

- **Consumer exposure to ethylene glycol-based low temperature thermal fluids** – These thermal fluids rarely come into direct contact with materials that are available to consumers, so consumer contact is unlikely. However, they are similar to coolant fluids used in motor vehicles. Review product labels and follow all instructions and guidelines for proper use to minimize unnecessary exposure. 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, isolate the area and absorb fluids with materials such as sawdust or vermiculite. Collect in suitable and properly labeled containers for disposal. These materials are not classified as dangerous to aquatic organisms. However, proper protective equipment should be worn.² See Environmental, Health, and Physical Hazard Information.

- **Large release** – Industrial spills or releases are infrequent and generally contained. If a large spill does occur, the material should be diked, captured, collected, and reprocessed or disposed of according to applicable governmental requirements. Isolate the area and keep unnecessary or unprotected personnel from entering the area. When relevant in scale or risk, the community should be notified of the hazards associated with the specific release event. Follow emergency procedures carefully. In case of fire, see Section 5 of the relevant Safety Data Sheet. See Environmental, Health, and Physical Hazard Information.

For more information, see the relevant Safety Data Sheet.

Health Information²

**Eye contact** – Eye contact with the liquid, vapor, or mist may cause slight irritation. Corneal injury is unlikely.

**Skin contact** – Brief contact is essentially nonirritating to skin. Prolonged or repeated contact may cause slight skin irritation with local redness. Repeated skin exposure to large quantities of ethylene glycol may result in absorption of harmful amounts. Massive contact with damaged skin or with material hot enough to burn the skin may result in absorption of potentially lethal amounts.
**Inhalation** – At room temperature, exposure to vapor is minimal due to its low volatility. With good ventilation, a single exposure is not expected to cause adverse effects. If the material is heated, and areas are poorly ventilated, then vapor or mist may accumulate, which may cause respiratory irritation and symptoms such as headache and nausea.

**Ingestion** – The oral toxicity of ethylene glycol is moderate. Small amounts swallowed incidental to normal handling operations are not likely to cause injury; however, swallowing large amounts of ethylene glycol may cause nausea, vomiting, abdominal discomfort, diarrhea, and/or serious injury—even death. Excessive exposure may result in central nervous system effects, cardiopulmonary effects, and kidney failure.

**Repeated exposure** – Repeated excessive exposure may cause irritation of the upper respiratory tract. In humans, effects have been reported on the central nervous system. In animals, effects have been reported on the kidney and liver.

**Other effects** – Ethylene glycol did not cause cancer in long-term animal studies. Based on animal studies, ingestion of very large amounts of ethylene glycol appears to be the major and possibly only route of exposure to produce birth defects. Ingested in large amounts, ethylene glycol has also been shown to interfere with reproduction in animals. *In vitro* and animal genetic toxicity studies were negative.

For more information, see the relevant Safety Data Sheet.

**Environmental Information**
Ethylene glycol is practically nontoxic to aquatic organisms on an acute basis. Ethylene glycol is readily biodegradable, its bio concentration potential (tendency to accumulate in the food chain) is low, and its potential for mobility in soil is very high.

For more information, see the relevant Safety Data Sheet.

**Physical Hazard Information**
Ethylene glycol is thermally stable at recommended storage and use temperatures. However, exposure to elevated temperatures can cause decomposition. Gas generated during decomposition can cause pressure build-up in closed systems. The decomposition products of ethylene glycol depend upon temperature, air supply, and the presence of other materials and may include aldehydes, alcohols, and ethers.

Ethylene glycol is incompatible with strong acids, strong bases, and strong oxidizers. Avoid contact with these materials.

Spills of ethylene glycol on hot fibrous insulation may reduce the auto ignition temperature, resulting in the potential for spontaneous combustion.

As with any liquid, spills can create slip hazards.

For more information, see the relevant Safety Data Sheet.
Regulatory Information

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

Additional Information

- Safety Data Sheet (http://www.dow.com/heattrans/contact/)

For more business information about DOW™ ethylene glycol-based low temperature thermal fluids, visit Dow’s glycol-based heat transfer fluids web site at http://www.dow.com/heattrans/.

References

1 DOWTHERM™ vs. DOWFROST™: A Comparison of Ethylene Glycol and Propylene Glycol, The Dow Chemical Company, Form No. 180-01305-799 AMS.
2 DOWTHERM IG Heat Transfer Fluid Material Safety Data Sheet, The Dow Chemical Company.
5 MEGlobal: Products and Applications: EG Manufacture web site: (http://www.meglobal.biz/).
7 Engineering and Operating Guide for DOWTHERM SR-1 and DOWTHERM 4000 Inhibited Ethylene Glycol-based Heat Transfer Fluids, The Dow Chemical Company, Form No. 180-1190-0901 AMS.
8 Estimates by The Dow Chemical Company.

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