



Alkoxytriglycols

Product Description

DOW offers three Alkoxytriglycol products: Methoxytriglycol, Ethoxytriglycol and Butoxytriglycol. These transparent, colorless liquids are high boiling-point, low vapor-pressure solvents with very low odor and relatively low toxicity. All are completely soluble in water at room temperature. They are miscible with alcohols, ketones, esters and most common organic solvents.

Applications

The versatility of the Alkoxytriglycols is demonstrated by the variety of applications in which they may find use. Their low volatility and excellent solvency make them highly effective carrier solvents for textile dye processes. They are superb solvents for printing and writing inks and in paint and floor polish strippers/removers. With their surface tension characteristics, water solubility and solvency for oils, the Alkoxytriglycols have potential for use in household, institutional, industrial and special-purpose cleaners. The coupling ability of these products enhances performance and improves shelf stability of cleaning products.

The Alkoxytriglycols are also used as low volatility components of hydraulic brake fluids, as chemical process solvents, and as intermediates for making ester solvents, surfactants and plasticizers. They are also well-suited for wood stain, lacquer, paint and varnish formulations.

Table 1 • General Solvent Properties

	Methoxytriglycol	Ethoxytriglycol	Butoxytriglycol
CAS #	112-35-6	112-50-5	143-22-6
Structure	CH ₃ O(C ₂ H ₄ O) ₃ H	C ₂ H ₅ O(C ₂ H ₄ O) ₃ H	C ₄ H ₉ O(C ₂ H ₄ O) ₃ H
Molecular Weight	164.2	178.2	206.3
Appearance	Transparent, colorless	Transparent, colorless	Transparent, colorless
Specific Gravity at 20/20° C	1.050	1.023	0.989
Density at 20° C g/L (lb./gal.)	1048 (8.74)	1021 (8.52)	987 (8.24)
Relative Evaporation Rate (n-Butyl Acetate = 1)	< 0.01	< 0.01	< 0.01
Solubility Parameters (Hansen) ¹			
Total	10.6	10.4	9.9
Nonpolar	7.9	7.9	7.8
Polar	2.6	2.4	2.0
Hydrogen Bonding	6.6	6.3	5.7

¹ Hoy Solubility Parameters available on request at 1-800-SOLVENT Technical Service Hotline.

Table 2 • General Physical Properties†

	Methoxytriglycol	Ethoxytriglycol	Butoxytriglycol
Boiling Point, °C	250	256	283 ⁽¹⁾
Closed Cup Flash Point, °C (°F)	135 (275)	129 (265)	138 (280)
Freezing Point, °C	-44	-23	-39
Vapor Pressure at 20° C, mmHg	<0.01	<0.01	<0.01
Viscosity, cP			
at 0° C	6.9	17.7	27.3
at 25° C	3.3	6.9	9.0
at 50° C	1.9	3.4	4.2

Solubility at 20°C, by weight %			
In water	100	100	100
Water in	100	100	100
Surface Tension at 25°C, dynes/cm			
Neat Product	36.4	33.7	30.0
25% Aqueous Solution	53.1	47.6	32.2

1 Decomposes at 760 mm Hg; Boiling Point extrapolated

Figure 1 • Vapor Pressure Curves

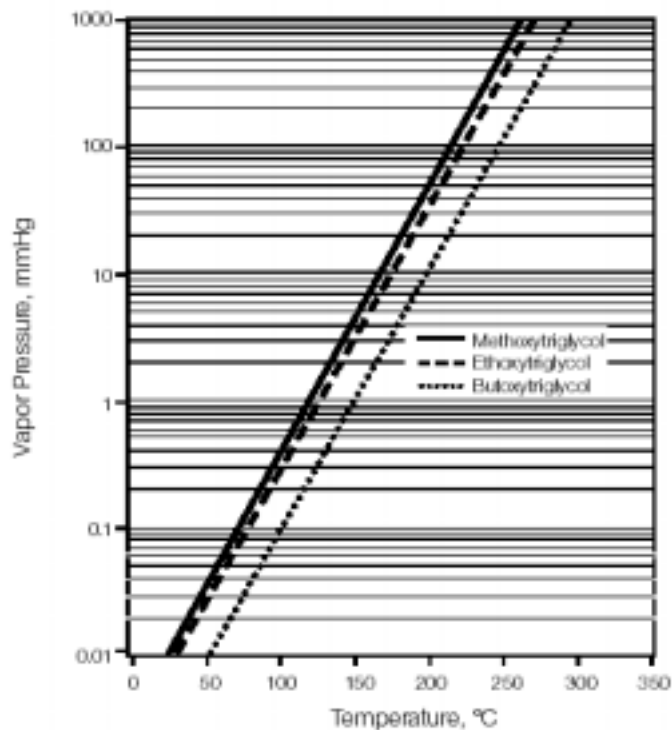
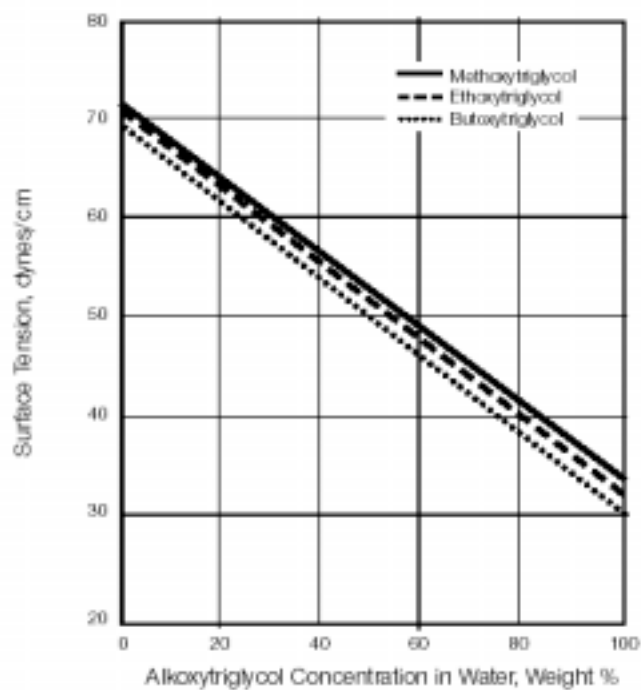


Figure 2 • Surface Tension Curves



Toxicology

Extensive animal testing of the Alkoxytriglycols confirms that they do not have significant potential to cause systemic, reproductive or developmental effects. The U.S. Environmental Protection Agency (EPA) and the Organization for Economic Cooperation and Development (OECD) have found that the toxicity database on Alkoxytriglycols further shows that they are unlikely under normal use conditions to cause adverse health effects or to pose risks to the environment.*

Biodegradation

Methoxytriglycol, Ethoxytriglycol and Butoxytriglycol offer excellent biodegradability when tested by Environmental Protection Agency/Organization for Economic Cooperation and Development (EPA/OECD) methods and classifications (Table 3). The Alkoxytriglycols are accommodated by conventional wastewater treatment processes at normally expected concentrations.

Table 3 • OECD 301-B CO₂ Evaluation Biodegradation Testing¹

	Methoxytriglycol	Ethoxytriglycol	Butoxytriglycol
28-Day Biodegradable	100%	92%	60%
Meets > 60% Biodegradable	Yes	Yes	Yes
Biodegradability	Readily	Readily	Biodegradable

¹ This test method monitors carbon dioxide produced from the biooxidation of molecular carbon in the test substance. Biodegradation is the percent ratio of evolved CO₂ to maximum theoretical CO₂. Based on organic carbon content of the test substance. The material meets the criteria if it passes from 10% biodegradable to 60% biodegradable within a 10-day period.

Environmental Impact

The Chemical Manufacturers Association CHEMSTAR[®] Ethylene Glycol Ethers Panel states, "Based primarily on calculated estimates as well as structural similarity to other glycol ethers, the triethylene glycol monoethers should not persist in the environment, should not bioaccumulate in animal tissues, and should be 'practically' non-toxic to aquatic organisms, based on EPA criteria."*

*CHEMSTAR[®] Ethylene Glycol Ethers Panel, TRIETHYLENE GLYCOL MONOETHERS FOUND TO BE OF LOW POTENTIAL RISK, July 29, 1998.

CHEMSTAR is a registered trademark of the Chemical Manufacturers Association.

Storage and Handling

Alkoxytriglycols can be stored in carbon steel for most applications. Stainless steel or high-baked, phenolic-lined tanks are recommended for applications where trace iron contamination or slight discoloration must be avoided. Piping can be made of the same material as the storage tank. A centrifugal pump is suitable for transfer service. Butyl rubber or EPDM rubber can be used for gaskets and packing. Do not use Viton[®] elastomers, neoprene or natural rubber. Avoid using aluminum, copper or copper alloys, and galvanized metals.

Alkoxytriglycols do not present a significant flammability hazard at normal storage temperature. They are low vapor-pressure, high flash-point solvents, however, and their flammability limits should be taken into account when a flammability hazard is being assessed. All local fire codes should be met when installing storage facilities. To avoid the possibility of induced static electricity, all tanks, pumps and transfer lines should be fully grounded.

Alkoxytriglycols have relatively low viscosities and freezing points. Heated storage tanks are not normally required. A possible exception is Ethoxytriglycol, which freezes at -9°F (-23°C).

Storage and Handling cont.

Alkoxytriglycols are stable when proper handling and storage conditions are employed. They slowly tend to develop increased acidity, water content and by-product esters. To preserve quality, store under a dry nitrogen atmosphere and/or use an appropriate desiccant system to prevent moisture contamination if low water levels are important.

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