



DOWTHERM^{*}, DOWFROST^{*}, AMBITROL^{*} Heat Transfer Fluids

Comparison of Ethylene Glycol vs. Propylene Glycol

Solutions of both ethylene glycol (EG) and propylene glycol (PG) will effectively lower the freezing point of water and for most applications can be used interchangeably or even as mixtures of the two. While there are many minor variations in the properties between EG and PG solutions, there are two key differences which usually dictate which of the glycols is chosen for a particular application - toxicity and viscosity.

Toxicity. EG is more toxic than PG. About 2 - 4 ounces of EG can be fatal if ingested by an adult human. Conversely, PG is a food additive which is not harmful to humans if ingested in moderate amounts.

As a result, EG use is more closely regulated by law than PG use. Therefore, PG solutions are favored for many applications, particularly when human exposure can occur.

Viscosity. While differences in viscosity between EG solutions and PG solutions at elevated temperatures are minimal, at temperatures below 0°F the viscosity differences become significant. If heat transfer at these low temperatures is required, it is much better with EG solutions. In addition, EG solutions will require less pumping horsepower under cold conditions. If these fluid characteristics are important, EG is usually chosen for the application.

Some minor performance differences between EG and PG solutions are listed as follows:

EG Solutions

- higher heat transfer coefficient
- better freeze point depression
- less swellability to plastics/elastomers
- higher surface tension, less leaks

PG Solutions

- better cavitation erosion protection
- concentrate does not freeze

References

- Engineering and Operating Guide for DOWTHERM SR-1 and DOWTHERM 4000 Inhibited Ethylene Glycol-based Heat Transfer Fluids
- Engineering and Operating Guide for DOWFROST and DOWFROST HD Inhibited Propylene Glycol-based Heat Transfer Fluids
- Engineering and Operating Guide for AMBITROL Inhibited Glycol-based Coolants

Physical Property Comparison

	Ethylene Glycol 100%	Propylene Glycol 100%	Ethylene Glycol Sol. 50% v	Propylene Glycol Sol. 50% v
Molecular Weight	62.1	76.1		
Freeze Point (°F)	8	-71(T _g)	-34	-29
Specific Gravity	1.110	1.033	1.082	1.050
Density (lb/ft ³ @ 70°F)	69.12	64.32	67.05	65.14
Flash Point (°F)	240	220	None	None
Boiling Point (°F)	387	369	225	222
Vapor Pressure (mm Hg@77°F) (psia @ 170°F)	.12 .07	.22 .14	16 4.6	21 5.2
Surface Tension (dynes/cm@77°F)	47	36	56	45
Solubility Parameter	17.1	15.0	N.A.*	N.A.*
Viscosity (cps @ 77°F)	16.5	44.0	3.4	5.4
-30°F	—	~20,000	64	263
170°F	3.5	4.5	1.04	1.20
Pressure Drop(psi/100ft.) (1 in. pipe 7ft/sec)				
-30°F	—	—	28.11	48.64
170°F	12.5	12.6	10.61	10.43
Biodegradation (20 day) part oxygen/part glycol % of theoretical oxygen demand	1.15 89	1.45 86		

*N.A. (Not Available)

Heat Transfer Fluids

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