DOWFROST™ GEO 20:

Propylene Glycol-Based Heat Transfer Fluid for Geothermal Heat Pump Systems

Geothermal coils eight feet underground.

This is the end of a system used to heat and cool a large residential home. Chemistry from Dow makes the most of this technology for homes, schools or other businesses.

DOWFROST™ GEO 20 Heat Transfer Fluid

For Use in Ground Source Heat Pumps

Freeze depressant fluids (antifreeze) are widely used in the HVAC industry. As HVAC applications evolve, performance requirements for heat transfer fluids are more specific. This brief guide describes performance criteria that should be considered when selecting the right heat transfer fluid for use in ground source heat pump applications. We think you will agree with the hundreds of customers already using DOWFROST™ GEO 20, that it represents an excellent choice of inhibited propylene glycols.

As illustrated below, the typical ground source heat pump (GSHP) will circulate DOWFROST GEO 20 through the ground using the earth's constant temperature to exchange hot air for cooler in the summer and cold air for warmer in the winter months.

DOWFROST GEO 20 is a ready-to-use propylene glycol-based heat transfer fluid intended for geothermal heat pump systems. It contains 20% by volume propylene glycol and contains specially designed corrosion inhibitors that satisfy ASTM D1384 requirements. DOWFROST GEO 20 will not sustain bio-organism growth when used at full strength, but its lower glycol content gives it lower viscosity and higher heat transfer efficiency. This product has a yellow to green color and is formulated with a freezing point of -7.5ºC (18.5ºF). DOWFROST GEO 20 is intended to be used only at full strength and only for geothermal heating and cooling systems.

Recommended Use Temperature Range

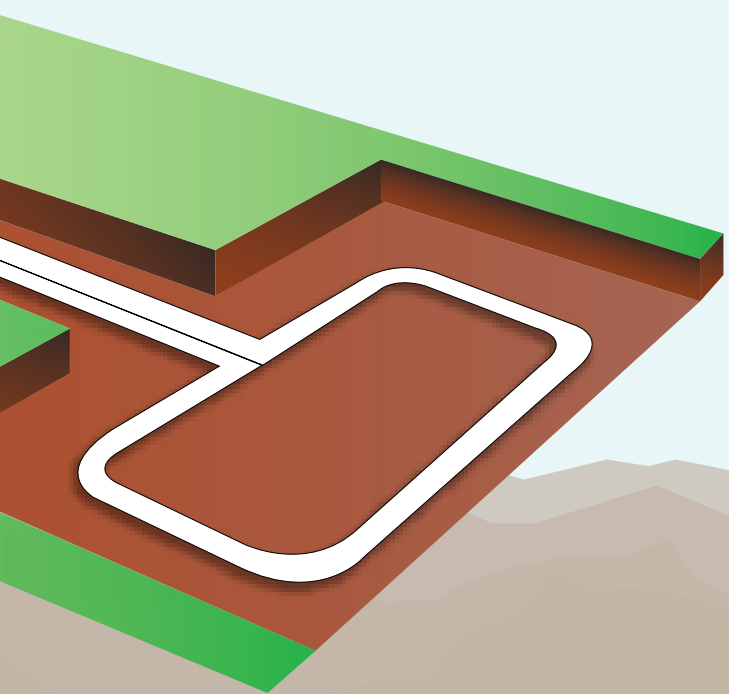
-5ºC (23ºF) to 100ºC (212ºF)

Typical Properties of DOWFROST GEO 20 Fluid

Composition (% by volume)
Propylene Glycol – 20
Performance Additive + Water – 80

Color – Yellow to Green
Specific Gravity – 1.017 - 1.027 25 / 25ºC (77 / 77 º F)
pH of Solution – 9.5 - 10.5
Reserve Alkalinity (min.) – 3.5 ml

Temperature		Specific Heat		Density		Thermal Conductivity		Viscosity	
C	F	kj/kg/K	(Bti/lb F)	kg/m	(lb/ft^3)	W/mK	Btu/hr/ft^2 (F/ft)	mPa.s	(cps)
10	(50)	3.922	(0.937)	1030.70	(64.34)	0.4703	(0.2718)	2.9862	(2.97)
40	(104)	3.982	(0.952)	1018.37	(63.57)	0.5051	(0.2918)	1.1839	(1.18)
65	(149)	4.032	(0.964)	1004.69	(62.72)	0.5251	(0.3034)	0.7137	(0.71)
90	(194)	4.082	(0.976)	987.93	(61.67)	0.5372	(0.3104)	0.4856	(0.49)
120	(248)	4.143	(0.990)	963.75	(60.16)	0.5429	(0.3137)	0.3407	(0.34)



Regulatory Considerations

This criterion is high priority because potential leaks could lead to contamination of both the soil and water supplies. The fluid must be low in toxicity to wildlife, readily biodegradable, and not listed or characterized as being a hazardous material subject to RCRA regulation (e.g. the flash point must be greater than 140ºF).

DOWFROST GEO 20 fluid satisfies all these requirements. Conversely, alternative fluids based on methanol are highly toxic, with a flash point of 54ºF and subject to RCRA regulation even when diluted to 20% by volume concentration. This low flash point causes methanol to be characterized as a hazardous waste upon disposal.

Toxicity and Flammability

In the interest of fire safety, a geothermal fluid should not have a low flash point (<140ºF), and should be low in acute oral toxicity to humans. DOWFROST GEO 20 is very low in acute oral toxicity and its primary ingredient (propylene glycol) is an FDA-approved food additive. By comparison, methanol is characterized as being relatively high in both acute oral and inhalation toxicity. And, due to its low flash point, extra safety precautions should be taken during installation and system operations with methanol to guard against fire and protect both the health and safety of those involved. Conversely, use of DOWFROST GEO 20 represents fewer potential hazards.

Efficient Heat Transfer

At the concentration supplied, DOWFROST GEO 20 fluid is not likely to be the limiting factor in heat transfer efficiency for the overall system. Though the heat transfer coefficient of methanol is somewhat better than that of DOWFROST GEO 20, in the great majority of GSHP applications, the limiting factor is the heat transfer of the earth / piping or the refrigerant in the evaporator. Therefore, slight differences in fluid heat transfer efficiency do not impact the overall system's heat transfer. It is possible (even likely) that changing from methanol to DOWFROST GEO 20 fluid will have no measurable impact on overall system heat transfer efficiency, even though the individual fluid coefficients differ.

Corrosion Control

In order to ensure the long-term success of the system and its equipment, a geothermal fluid must pass ASTM D-1384 corrosion evaluation and should provide 20-year corrosion protection for heat pump systems without any required maintenance for two decades. DOWFROST GEO 20 provides corrosion protection well within the recommended guidelines for typical metals and can provide 20+ years of worry-free protection. Conversely, when methanol is used, the fluid is often installed without, or with improper, corrosion inhibitors. This could lead to serious corrosion problems and equipment failure.

For Further Information, Call:

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