



Houghton Chemical Corporation

Geothermal Fluids Made Simple



Types of Fluids

1. Water
2. Glycol
 - a. Propylene
 - b. Ethylene
3. Alcohol
 - a. Methanol
 - b. Ethanol



Characteristics

Water

- | | |
|-------------------------------|--------------------------|
| a. Concentration | as is |
| b. Thermal Conductivity @60°F | 0.335 BTU/(hr) (ft) (°F) |
| c. Freeze Point | 32°F |





Characteristics

Propylene Glycol

- | | |
|-------------------------------|-------------------------|
| a. Concentration | 25% by volume |
| b. Thermal Conductivity @60°F | 0.27 BTU/(hr) (ft) (°F) |
| c. Freeze Point | +14°F |





Characteristics

Ethylene Glycol

- | | |
|-------------------------------|-------------------------|
| a. Concentration | 25% by volume |
| b. Thermal Conductivity @60°F | 0.28 BTU/(hr) (ft) (°F) |
| c. Freeze Point | +6°F |





Characteristics

Methanol

- | | |
|-------------------------------|-------------------------|
| a. Concentration | 25% by volume |
| b. Thermal Conductivity @60°F | 0.29 BTU/(hr) (ft) (°F) |
| c. Freeze Point | -16°F |





Characteristics

Ethanol

- | | |
|-------------------------------|-------------------------|
| a. Concentration | 25% by volume |
| b. Thermal Conductivity @60°F | 0.28 BTU/(hr) (ft) (°F) |
| c. Freeze Point | +7°F |





Corrosion Inhibitors

Phosphate Steel, cast iron, lesser extent copper & aluminum

Azole Yellow metals, copper & brass

Borate Steel, cast iron

Nitrite Steel, cast iron



EXOTIC FLUIDS

Brine:

Calcium Chloride -4⁰F 25% solution, extremely corrosive

Potassium Acetate & Potassium Formate:

It is a salt used as a runway de-icer, extremely corrosive

Beet Juice:

From Sweden, made from Betaine from sugar beets

1,3 Propane Diol:

Dupont biproduct from bioprocessing of corn syrup.



Water Quality

Water quality is of the utmost importance to maximize the corrosion protection and life of the fluid you are using. Very hard municipal water and soft water will dramatically reduce the life and effectiveness of the fluid. Most manufacturers of geothermal fluids recommend de-ionized or RO water.

If municipal water is to be used it should meet or exceed these standards:

Calcium Carbonate	100 ppm
Calcium	50 ppm
Magnesium	25 ppm
Chloride	40 ppm
Sulfate	100 ppm

Product Handling & Safety

Water

Completely safe to handle.

Propylene Glycol:

Safe to handle, not on EPA hazardous chemical list, contain large spills

Ethylene Glycol:

Poisonous, spills in excess of 5,000 lbs. (approx. 550 gals.) of full strength ethylene glycol must be reported to the EPA. Rubber gloves should be worn, avoid inhaling and ingesting.

Methanol:

Extremely flammable and poisonous, can defat skin. Wear rubber gloves. All containers must be grounded to dissipate build-up of static electric charge. Avoid inhaling and ingesting. Spills must be reported to the EPA. 25% dilution still considered flammable.

Ethanol:

Extremely flammable. Can defat skin. If denatured properly, not poisonous. Wear rubber gloves. All containers must be grounded to dissipate buildup of static electric charge. Spills must be reported to the EPA. 25% solution is still considered flammable.

Pricing

Cost per gallon FOB shipping point full strength undiluted product

Water	\$0.01/gallon
Methanol	\$2.50/gallon
Ethylene Glycol	\$8.00/gallon
Ethyl Alcohol	\$8.00/gallon
Propylene Glycol	\$11.00/gallon