DOWTHERM™ and DOWFROST™ Heat Transfer Fluids

Inhibited vs. Uninhibited Glycols

Glycol fluids are well known for their ability to provide freeze protection for closed-loop, water-based HVAC and cooling systems. They significantly lower the freezing point of water, and they eliminate the need for costly, inconvenient, seasonal system draining.

But while many HVAC system engineers, contractors, and operators accept glycols as the freeze protection of choice, they may not be aware of the critical differences that could have a direct bearing on how well, or how poorly, the fluid they choose will protect their system.

Today, your initial investment in a heat transfer fluid or secondary heating and cooling will pale beside the costs you may be facing for chillers, pumps, piping, and other hardware components for increasingly sophisticated HVAC and food and beverage cooling systems. But at the same time, your system's overall performance, longevity, and long-term cost may well hinge on the type of heat transfer fluid you select.

Although you may be tempted to purchase so-called "glycol" alternatives, these fluids may not provide adequate protection for your HVAC system. Moreover, putting them into your system could eventually cost you far more than the initial price fluid.

Uninhibited, or "plain," glycols may seem an attractive choice because of their ability to provide freeze and burst protection and because of their relatively low cost. But freeze protection is not the only reason to take care in your choice of fluids. The fact is, corrosion presents an ongoing threat to your water-based system components that cannot be ignored. Heat, oxygen, chlorides, sulfates, metallic impurities, and other contaminants can increase the rate of corrosion in your system, which eventually could lead to unscheduled system shutdowns, high maintenance expense, and reduced system life.

Avoiding Uninhibited Glycols

Plain glycols, because they lack corrosion inhibitors, can actually increase the threat of corrosion in your system. Glycols produce organic acids as they degrade, especially when heated. If left in solution, these acids will lower the fluid's pH. With no corrosion inhibitors to buffer these acids and protect the metals in the system, the corrosion rate of a solution of plain ethylene or propylene glycol can be greater than that in plain water, which can be highly corrosive in its own right.

The industrial inhibitor packages used in DOWTHERM™ ethylene glycol-based and DOWFROST™ propylene glycol-based fluids are specially formulated to help prevent corrosion in two ways. First, the corrosion inhibitors "passivate" the surfaces of the metal, so they are less susceptible to corrosion. Second, the inhibitors buffer the organic acids formed as a result of glycol oxidation to keep the fluids from becoming acidic. Thus, the Dow fluids provide corrosion protection without reducing your system's heat transfer efficiency by fouling.

The table on page 2 provides the comparative corrosion effect that inhibited and uninhibited glycol-based fluids and plain water may have on metals commonly found in HVAC systems. The results are based on corrosion test ASTM D1384, at 190°F, for two weeks, using standard ASTM test metals, and 30% glycol solutions in corrosive water, with air bubbling.

Corrosion Testing Results*: Corrosion Rate - Mils per Year

	Plain Water	Plain PG	DOWFROST™ Fluid	DOWFROST™ HD Fluid	Plain EG	DOWTHERM™ SR-1 Fluid
Copper	0.08	0.16	0.20	0.04	0.16	0.12
Solder	3.14	34.70	0.03	0.06	56.50	0.14
Brass	0.22	0.20	0.16	0.08	0.46	0.11
Steel	9.69	9.80	0.04	0.04	44.50	0.03
Cast Iron	21.10	16.20	0.15	0.05	55.70	0.13
Aluminum	13.20	1.80	+0.26	+0.36	19.80	0.44

Note: The test data listed are intended for screening purposes only. Corrosion rates in excess of 0.5 mils per year (2.5 mils per year for aluminum) are generally not considered adequate for corrosion protection.

Note: Samples with a + showed a weight gain.

*Based on corrosion test ASTM D1384

These results show the potential drawbacks of using an uninhibited glycol solution in your HVAC system. A high level of corrosion may take place. On the other hand, Dow fluids, when properly maintained, can provide long-term corrosion protection, in addition to freeze protection, in a cost-effective manner.

Reference

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