AUGUST 2024

From Experience

Propylene Glycol: Too Much of a Good Thing

Propylene glycol is used throughout the food processing industry in process heat transfer coolant systems. Available in food-grade forms and with corrosion inhibitors included, propylene glycol is used when direct cooling with primary refrigerants is not acceptable, and the use of water alone would be at risk of freezing.

Available in both pre-mixed and concentrate forms, propylene glycol and water must be replenished following system maintenance and repair. Over time though, many forget the specific concentration required, and to make sure they have the freeze protection required, may conclude that a higher concentration must be better, e.g., "If a 30% mixture is good for my system, 50% must be even better."

However, an improper concentration of propylene glycol can hamper performance and result in unnecessary costs. As the table on the following page illustrates, a solution with a higher propylene glycol concentration is more viscous and therefore requires more energy to be pumped. In addition, heat capacity decreases as concentration increases, resulting in the need for either colder glycol or a higher flow rate for the same heat load. Therefore, adding too much propylene glycol actually increases the pump re-quirements and decreases heat transfer efficiency, resulting in higher operating costs.

Continued on next page. >

EXPERIENCE IN BRIEF

Best Practices in Glycol Systems Design:

1. Use a concentration of propylene glycol with a freezing point that is 5°F below the lowest expected ambient or operating temperature.
2. Minimize corrosion in carbon steel piping systems by specifying inhibited glycol, and operating the system as "closed loop" to minimize the oxygen content of the glycol solution.
3. Consider the use of a handheld refractometer. Suitable for on-site use, and using just a few drops of fluid, this tool can determine the propylene glycol concentration by measuring how much light bends as it moves from the air to the fluid.

Physical Properties of Propylene Glycol Solutions

% Propylene Glycol by Volume	Freezing Point (°F)	Physical Properties at 20°F	
		Specific Heat (BTU/lb °F)	Viscosity (centipoise)
20	19	0.94	5
30	8	0.90	10
40	-7	0.86	19
50	-29	0.82	28

As an example, using 50% propylene glycol at an operating temperature of 20°F, when 30% would be sufficient, leads to an 8% increase in required flow rate due to lower specific heat and a 20% higher pump power requirement due to higher viscosity and higher friction losses. (Note: Actual results may vary depending on the system design.)

RELATED CONTENT

[The Essentials of Roof Load Capacity]
[Conduit Seal Effectiveness]

CONTACT US

Direct any comments or questions to:

Keith Nienhaus, P.E.
Manager of Refrigeration Engineering
knienhaus@hixson-inc.com
Phone: 513.241.1230
www.hixson-inc.com