Glycols used with Duraplus™ Industrial ABS

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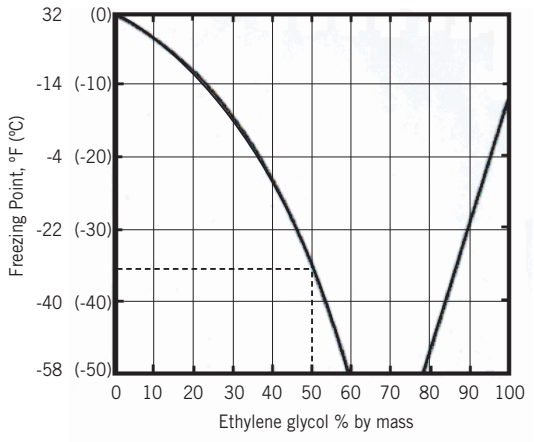
INDUSTRIAL PIPING SYSTEMS

The use of glycols in refrigeration is quite extensive. Many industrial and commercial applications require secondary refrigerant systems capable of providing continuous cooling. The list of users is extensive, including; hockey arenas, freezers, skating rinks, cold storage facilities, isothermal storage etc. The selection of a proper thermoplastic piping system for these demanding applications is critical to the success of any cooling project.

Depending on the cooling application, glycol is generally mixed with water (e.g. 50%) allowing the cooling system to operate at temperatures lower than water alone.

Figure 1 – Freezing point of Ethylene Glycol



The concentration of glycol in water will determine the maximum cooling capabilities of the mixture. It should be noted, for all mixtures where glycol is added to water there is an increase in pressure drop and a decrease in heat transfer. A good operating rule, therefore, is to concentrate the mixture no more than is necessary to prevent freezing. In a cooling application for example, Figure 1 shows the freezing point of ethylene glycol – water solutions. At 50% glycol by mass the freezing point of the solution is –36.4°F (–38°C). In systems with temperatures this low, care must be taken during the selection of the thermoplastic pipe material. There is currently only one piping material suitable for this type of application, Duraplus™ ABS Industrial. This ABS piping system has a temperature operating range from –40°F to 140°F (–40°C to 60°C). Duraplus ABS Industrial has exceptional resistance to accidental damage and remains ductile even at these extremely low temperatures.

Selecting compatible Glycols for use with Duraplus Industrial ABS

What are Glycols?

Glycols are common Heat Transfer Fluids (HTF) / antifreeze / secondary refrigerants used in low temperature applications. Secondary refrigerants are fluids that carry heat from a substance being cooled to the evaporator of a refrigeration system. These secondary refrigerants experience a change in temperature when they absorb the heat and then liberate the heat at the evaporator.

Below are two types of glycols currently used in (HTF) / antifreeze refrigerant systems.

Ethylene Glycol (EG)

The majority of antifreeze produced uses EG. EG is less expensive and provides a lower freeze point at a 50% ratio for water to glycol when compared to propylene glycol.

Generally, ethylene glycol is clear, colorless but usually has color added before being sold. It has syrupy-like properties at room temperature. It is also very toxic and is not recommended for use in applications where it can come into contact with food or people.

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Propylene Glycols (PG)

Propylene glycols ($C_3H_8O_2$) are colorless, particularly odorless liquids. They are highly hygroscopic and miscible in all ratios with water, alcohols, esters, ketones and amines. It has limited miscibility with halogenated hydrocarbons and is not miscible with aliphatic hydrocarbons. Propylene glycols are generally more environmentally friendly.

Organic Salts

The following table facilitates the examination of glycol based and organic salt heat transfer chemicals that may or may not be used in cooling applications and allows the user to determine if a particular heat transfer chemical is suitable with our Duraplus Industrial ABS system. This can be done by checking the chemical name, CAS number and chemical nomenclature.

Suitability of Glycols for Use with ABS

Heat Transfer Chemical	Chemical Nomenclature	Operating Temperature Range	Maximum Antifreeze Concentration	Suitable Piping System	CAS Number
Ethylene Glycol / Monoethylene Glycol	$C_2H_6O_2$	-40°F – 140°F (-40°C – 60°C)	Up to 100%	Duraplus ABS Industrial	107-21-1
Diethylene Glycol	$O(CH_2CH_2OH)_2$	unsuitable	unsuitable	unsuitable	111-46-6
Triethylene Glycol	CH_2-CH_2-O-CH_2-CH_2-O-CH_2-CH_2 OH OH	unsuitable	unsuitable	unsuitable	112-27-6
Propylene Glycol / Monopropylene Glycol / 1, 2 Propanediol	$CH_3CH(OH)$-CH_2OH	-40°F – 140°F (-40°C – 60°C)	Up to 100%	Duraplus ABS Industrial	57-55-6
1, 3 Propanediol	$CH_2(CH_2OH)_2$	-40°F – 140°F (-40°C – 60°C)	Up to 100%	Duraplus ABS Industrial	504-63-2
Dipropylene Glycol	$HOC_3H_6OC_3H_6OH$ or $H(OC_3H_6)_2OH$	unsuitable	unsuitable	unsuitable	25265-71-8
Tripropylene Glycol	$H(OC_3H_6)_3OH$	unsuitable	unsuitable	unsuitable	24800-44-0
Polypropylene Glycol	$H[OCH(CH_3)CH_2]nOH$	unsuitable	unsuitable	unsuitable	25322-69-4
Potassium Formate	KO_2CH	-76°F – 122°F (-60°C to 50°C)	Up to 100%	Duraplus ABS Industrial	590-29-4
Potassium Acetate	$C_2H_3KO_2$	-60°F – 122°F (-51°C to 50°C)	Up to 100%	Duraplus ABS Industrial	127-08-2
Calcium Chloride	$CaCl_2$	-60°F – 23°F (-51°C to -5°C)	Up to 100%	Duraplus ABS Industrial	10035-04-8

NOTES:

1. Propylene glycol, Monopropylene glycol and 1, 2 Propanediol are the same chemical. These are three different names currently used in industry for PG.
2. Do not use Diethylene glycol and Triethylene glycol under any circumstances with Duraplus ABS Industrial.
3. Do not use Dipropylene glycol and Tripropylene glycol under any circumstances with Duraplus ABS Industrial.
4. Do not use Polypropylene glycol under any circumstances with Duraplus ABS Industrial.
5. 1, 3 Propanediol, although suitable for refrigerant cooling applications, is not commonly used in this industry.
6. Only use Duraplus ABS Industrial at an operating temperature range of -40°F to 140°F (-40°C to 60°C)

⚠ WARNING

Chilled water systems are typically treated and include additives. The purchaser should ensure that all treatment chemicals and additives are compatible with the piping system.

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