fluidguide-over250gal

DURATHERM
Heat Transfer Fluids

FLUID SELECTION: LARGE SYSTEMS

Guide to Fluid Selection for Systems Over 250 Gallon and/or Electrically Heated

The intent of this paper is to help you make an educated decision when selecting a heat transfer fluid. While most applications are unique, this guide should provide enough background to make choosing a fluid for your application much easier.

There are a wide variety of high-temperature heat transfer fluids available on the market today, so you have a lot of options to consider. Some of these fluids are recommended for open-to-atmosphere systems and some are not. Some are rated for use as high as 398°C (750°F), while some are only recommended for temperatures as low as 232°C (450°F).

All claim to transfer heat efficiently, but what other factors should you be considering in making an informed decision?

Most systems over about 950 liters or 250 gallons are designed to protect the heat transfer fluid from elements such as oxidation and thermal degradation. Expansion tanks are often blanketed with a buffer or inert gas to help reduce oxidation. Often there are numerous other safety measures like low flow or level shutoffs that will further help protect the fluid from thermal degradation.

So How do Fluids Break Down?

Oxidation

Scientifically speaking, oxidative degradation is the reaction of oxygen (in air) with the fluid by a free radical mechanism. This process forms larger molecules that end up as polymers or solids. These elements can then thicken the fluid, thereby increasing its viscosity. The more viscous a fluid becomes, the more difficult it will be to pump. Its heat transfer characteristics will also be compromised, and the acidity or TAN (Total Acid Number) of the fluid will increase and there will be a greater risk of coke formation within the system.

As with a lot of chemical reactions, oxidation occurs more rapidly as temperatures increase. The reaction rate is hardly measurable at room temperature but as a temperature rises, the risk of oxidative degradation increases exponentially in the absence of special measures such as inert blanketing of expansion tanks.

Put simply, oxidation happens when hot fluid comes in contact with air. Signs of fluid oxidation become evident with the formation of sludge within the system – especially in low flow areas such as reservoirs or expansion tanks.

Thermal Degradation

Thermal degradation, or thermal cracking, is the breaking of carbon-carbon bonds by heat in the fluid molecules. This forms smaller fragments called "free radicals" and in some cases, this is as far as the reaction goes. In others, the fragments may react with each other to form larger polymeric molecules.

In heat transfer terminology, these outcomes are known as "low boilers" and "high boilers".

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Caption:

Description:

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