Paratherm Corporation
Heat Transfer Fluid

Heat Transfer Fluid Tips

Rev. 800

Heat transfer fluids (hot oils, thermal liquids) are manufactured from highly refined petroleum, synthetically formulated hydrocarbons or siloxanes (silicone). Able to provide high temperatures at very low system pressures, heat transfer fluids offer safety, low maintenance and extended operating lifetimes as major benefits.

The pressure of 600°F steam is over 1500 psig. At the same temperature, Paratherm fluids have vapor pressures less than 1/3 atmospheric pressure.

Mixing Heat Transfer Fluids

Mixing various hydrocarbons and subjecting the mixture to high temperatures and turbulence can be highly unpredictable.

Compound the problem with the possible catalytic effects of normal system contaminants and your system may be creating unknown and unwanted chemicals. We strongly suggest **never** mixing fluids.

Cleaning New Systems

There are many contaminants that can find their way into heat transfer systems. New systems are no exception. Hard contaminants such as weld slag and spatter, and mill scale can damage pump bearings and seals and control valves. The mill scale can promote fluid oxidation.

"Soft" contaminants such as protective lacquers and coatings, oils and welding flux are thermally unstable and can cause degradation of the fluid. While you can replace damaged fluid somewhat inexpensively, it's another matter to go through the cost and downtime of replacing mechanical seals, control valves and pumps.

We strongly recommend that your system be *completely* clean and dry before charging with heat transfer fluid.

Water in Your System

No system we've seen has been entirely free of water. The more complex the system, the more water is usually present—and the more difficult its removal. One proven method is to locate system low points having drain valves. Open each valve and drain a small quantity of fluid into a beaker.

If you see a phase separation (one liquid floating on top of another), keep draining until you draw pure fluid. Jog the pump, bringing "new" fluid to each low point. Continue the sampling and jogging procedure until no phase separation is observed (allow enough time for the water to work its way down to the low point).

Any remaining water can be "steamed off" by running the system at about 225°F with all vents and the expansion tank warm-up valve open. Once the vent system stops "steaming," the system can be carefully taken to operating temperature safely.

Note: *Although "hydro" testing is a commonly accepted practice with heat transfer systems, we ask that you consider alternatives such as pressure-testing with inert gas or with the heat transfer fluid itself. Water in a system can cause pump cavitation and corrosion and, if trapped in a "dead leg" and hit by high-temperature oil, can flash to steam and literally blow the pipe or tubing apart. And if the pipe doesn't burst, the expansion can push a slug of hot oil out the expansion tank's vent— a serious safety hazard.*

Leak Testing/Prevention

Pressurize the system with inert gas and use soap-bubble detection fluids at potential leak points. Heat transfer fluids can leak through gaskets, seals and packing if they're not properly installed. Refer to our bulletin *Recommended Hot Oil System Components* for more information.

Add to this large metal dimensional change from thermal expansion and contraction, and leak prevention becomes critical. The *components* bulletin details proper pipe, flanges, insulation, packing, gasketing and sealants, among others.

Draining Your System

Bring the oil temperature up to about 225°F, and circulate the fluid until you are assured of thorough mixing. At this temperature the fluid will be less viscous, and many solids will be suspended. Thoroughly drain using valves at the system's low points. As the fluid drains, observe what comes out. If you see chunks of carbon and other solids, you should consider flushing with the heat transfer fluid you intend to use. Call us for additional information.

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Note: *Heavily fouled system? We suggest you consider cleaners other than water-based types. Water is difficult to remove, and can cause pump cavitation and system upsets.*

Charging Your System

Connect a small positive-displacement pump to a low-point drain near pump suction. A convenient place to fill is the blowdown valve which is often located on the strainer. The strainer is usually located upstream of pump suction. Bottom-filling will substantially reduce the entrainment of air, a common cause of pump cavitation. Bottom-filling allows the system to vent normally as the fluid enters.

Consider purging the system with inert gas prior to charging. Inert gas forces the air out, and can assist with the removal of water vapor as well. And once the system is brought up to temperature, inert gas bubbles will not contribute to fluid oxidation.

Preventing Oxidation

Organic heat transfer fluids, whether natural or synthetic, will oxidize in contact with air. Oxidation can begin as low as 250°F, and will double with every 20°F rise in bulk fluid temperature. Oxidation will cause the fluid to thicken and to become acidic and sludgy. And the fluid can become more susceptible to thermal degradation.

If your system is not equipped with a cold-seal tank, and the temperature of the fluid in the expansion tank runs hotter than 200°F, we strongly suggest you consider blanketing the tank with inert gas. Nitrogen is inexpensive and readily available. We suggest that you purge the system with inert gas prior to charging. This, coupled with the inert gas blanket will not only protect the fluid against oxidation, but will assist in keeping contamination and water vapor out.

Note: *If your system employs a deaerator/cold-seal expansion tank, insulate the deaerator portion only, leaving the remainder bare.*

Cold Weather Deliveries

During shipment, air bubbles can become entrained in the fluid. If the cold fluid is immediately pumped into the system, the air bubbles can cause pump cavitation. It's best that the fluid be as near room temperature as possible prior to charging the system. You might store the drums in a warm room, or employ drum warmers to bring the fluid up to room temperature. The warmer the fluid, the more easily it will pump into your system.

Final Notes

1. ***Cleanliness:*** *By removing mill scale, quench oils, protective lacquer coatings and weld flux, spatter and slag from each section of pipe, each component and all fittings* ***before*** *they are installed; and by thoroughly cleaning and drying the heater and all users before installation, you can avoid many problems later on.*
2. ***Filtration:*** *Before start-up, check and clean all filters and strainers. It's best to pull the filter or strainer several times just after start-up to make sure that it's clean and not restricting flow. Matter stuck in the filter can be an indication of trouble, and can help you avoid a potentially serious problem. If the strainer is to be mounted near a control valve, we suggest it be installed on the inlet side of the valve. This will help keep the valve free from matter that could cause improper valve operation.*
3. ***Fluid Analysis:*** *Periodic analysis of your fluid can help pick up glitches before they become serious problems.*

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