Paratherm™
HEAT TRANSFER FLUIDS
A Division of Lubrizol

Significance of Flash and Fire Points in Heat Transfer Fluids

Rev. 716

Heat transfer fluid systems have been in safe operation in the U.S. in excess of 80 years, and in Europe since well before the turn of the century. The rapid spread of these systems today is testament to their safety of operation.

*Note: Heat transfer systems **typically and routinely** operate at temperatures well in excess of their fluid's flash and fire points.*

Flash and Fire Points

A heat transfer fluid's flash and fire points are the temperatures at which the fluid's vapors, mixed with the right proportions of air, will ignite in *direct and intimate* contact with a spark or open flame.

Fluid to be tested is placed in a cup along with a temperature probe. The cup is placed on a hot plate and an ignition source (gas flame or electric arc) is located just above the cup. The hot plate is turned on.

As it heats up, the fluid produces vapors. When enough vapors are produced so that the cloud is ignited by the open flame (the cloud "pops"), the technician reads the thermometer. This is the flash point.

Continuing to heat, the fluid produces more and more vapor. When the "popping" becomes a continuously burning flame, the technician again reads the thermometer. This is the *fire point.*

Until the fire point is reached, should the ignition source be removed, the fluid merely sits there and oxidizes (it smokes).

System Leakage

Unlike high-pressure hydraulic systems, thermal oil systems are not generally pressurized. The typical atmospheric closed-loop heat transfer system employs a vent line that runs from the head space in the system's expansion tank to a catch container beneath. Even though these systems are normally unpressurized, there are occasional leaks. The leaks that do occur are found mostly in threaded fittings, joints, valves and pumps — the fluid will slowly weep rather than gush or spray. This "weeping" is similar to the way bolt loosener works its way through tiny openings.

Upon contact with outside air, the hot fluid oxidizes (it will smoke). This is nearly identical to the smoke vegetable oil produces when it is overheated on the kitchen stove. Leaking heat transfer fluids will typically smoke rather than burn, even at temperatures in excess of their flash and fire points. The smoking will continue until all that remains on the piping is a dark stain.

*Note: Unoxidized thermal oil **vapors** leaking from a system can be highly flammable. You should take immediate action.*

Insulation Fires

Should heat transfer fluid be allowed to wick through porous insulation however, oxidative decomposition will take place within the insulation. As the fluid oxidizes, heat is produced. This is similar to the way heat is generated in a pile of oily rags or wood chips.

Heat produced from this oxidation process adds to heat from the system that is already present in the insulation. And the insulation prevents the extra heat from quickly escaping.

Temperatures within the insulation begin to climb higher and higher — and may ultimately exceed the fluid's *autoignition* temperature, the temperature at which the fluid spontaneously ignites.

If air enters the insulation at this point and contacts the partially oxidized and degraded fluid,spontaneous ignition can immediately result.

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2009 Renaissance Boulevard ▪ King of Prussia, PA 19406 USA ▪ +1 610-941-4900 ▪ +1 **800-222-3611** ▪ FAX +1 610-941-9191
E-mail: info@paratherm.com ▪ Web: www.paratherm.com

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Insulation

It is *very* important to quickly find and eliminate leaks in heat transfer systems. We suggest you locate *all* potential leak points in the system, and, at these points, specify the use of high-temperature closed-cell insulation (Pittsburgh Corning Foamglas or equal) — or no insulation at all. Most important, you should never fail to perform regular system checks.

Like many other thermal liquids, the Paratherm **NF**®,**HE**® and **OR**® fluids have proven exceptionally safe. For years they have been used in a broad range of demanding systems where bulk fluid temperatures well exceed the fluid's flash and fire points.

Questions? We'd like to hear from you. Call toll-free, +1 800-222-3611, or fax or e-mail us, or visit our website, **www.paratherm.com**.

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