

Thermal Fluid System Leakage

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Heat transfer oils are formulated to move fast and carry maximum heat at high temperatures. But the properties that will optimize these performance characteristics — low viscosity and high density — also complicate efforts to keep the fluids' molecules contained at operating temperatures. The very properties that make them good heat transfer media also make them prone to leakage.

Leak Detection

One of the simplest leak detectors for thermal fluid is the smoke that shows up when the hot fluid is exposed to air. The amount of smoke depends on the size of the leak, the temperature of the fluid and to some extent the airflow in the area. Small oozing leaks can produce an exaggerated amount of smoke because there isn't enough fluid to form a drop. This steady weeping smokes and then cooks onto the metal near the leak, leaving dark stains, or — in time — a carbon crust.

With larger leaks, the fluid usually cools quickly as it drips or sprays into the air. Since smoke is actually the reaction of the heat transfer fluid's volatile low-boiling portions (smaller molecules) with oxygen in the air, this cooling reduces the vaporization of fluid which helps lessen the amount of smoke. However, if the leak is large enough that its oxidation uses up all the fresh air — or if ventilation is

insufficient — vapor can accumulate and cause a potential fire hazard.

The key to preventing safety problems from leaks is to make sure thermal fluid systems are not operated in enclosed areas without adequate ventilation. Ensure adequate fresh air flow in any location (valves, flanges, instrument ports, pumps, expansion tanks, for example) where the potential exists for a significant leak.

To Minimize Leaks

1. System Maintenance: Hot metal increases in length (and diameter). Bolts stretch. Piping runs increase up to 4" per 100' of length. Hot fluid is also much thinner than cold (above 400°F, less viscous than water at room temperature). In new and old systems, the biggest sources of leaks are flanges. Leaking flanges should be re-torqued. If you have to remove the insulation to get to the flange, make sure you read about insulation fires in Paratherm's Fire Prevention in Thermal Oil Heat Transfer Systems technical data sheet. Use fluoro-carbon based thread sealant or Teflon tape on threaded fittings and tighten them down.

2. Prevent Operator Error: All of the drain valves should be closed before adding fluid. All of the block valves should be closed before opening a line. Pressure gauges should have isolating valves and

be located so that they cannot be accidentally removed with a fork truck. Leaking pump seals should be replaced before they flush out the bearing grease. The expansion tank level should be checked before startup.

Flash, Fire, and Autoignition Points Demystified

Three major technical terms describe flammability conditions in hydrocarbon liquids and their vapors; flash point, fire point, and autoignition temperature.

Flash Point Defined

The lowest temperature at which a heated liquid's vapor/air mixture can be ignited ("flashed") by a flame or spark, or other ignition source placed above the liquid surface.

Fire Point Defined

The lowest temperature at which a heated liquid's vapor/air mixture will burn continuously when combustion is supported by ignition sources such as the above.

Autoignition Temperature Defined

The temperature at which the vapor formed by a heated liquid will flash without a source of ignition.

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Flash Point and Fire Point Testing

The liquid to be tested is heated in a cup and the rising liquid temperature is continuously measured. A small flame is mechanically passed back and forth just above the surface of the liquid. As the liquid gets hotter, more of it evaporates causing the fuel/air mixture above the liquid to gradually become richer. When the lower flammability limit is reached, the ignition source will ignite the

vapor/air mixture, causing a pop. The observed temperature when the flame momentarily ignites the vapor/air mixture is the Flash Point. The ignitions repeat as the liquid temperature continues to rise. The observed temperature when the burning becomes continuous is the Fire Point.

Autolignition Temperature Test

A sample is injected into a flask which is heated to the test temperature. If a “flash” is observed

in the container, that temperature is the Auto Ignition Temperature. If no flash is observed after a period of time, the flask temperature is increased and the test repeated. This method (ASTM E659-78) is valid only for fluids that are completely vaporized at the test temperature since the degradation products formed by any remaining liquid will affect the test result.

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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