Practical Advice for Dealing With Heat Transfer Fluid

You can improve the service life of heat transfer fluid by properly handling it. This exclusive report examines ways to minimize thermal cracking, oxidation and contamination

Pressure test the system with either heat transfer fluid or inert gas. Never pressure test with water. Mark E. Smith The service life of heat transfer fluid and related process efficiency can be increased by understanding how fluid breaks down and how to properly handle it. The key to increasing fluid life is to minimize thermal cracking, oxidation and contamination and to follow proper handling techniques. These are reviewed below.

Thermal Cracking

All fired and electric-immersion type heaters are capable of exceeding the maximum recommended film temperature of the heat transfer fluid under certain conditions. Exceeding the maximum film temperature for a period of time can cause excessive cracking and premature fluid failure. Excessive cracking can be minimized in the following ways. &#149 Maintain design fluid velocity. Pressure drop across the entire system should be calculated when sizing pumps. System bypass valve response should be tuned to maintain design fluid flow rate under all process conditions. Filters and strainers should be properly located and monitored to prevent blinding. &#149 Bring cold systems to temperature slowly. Cold fluid can overheat if the heater operates at full power from start-up. Fluid temperature should be increased in 25&#176F (15&#176C) increments until fluid viscosity is less than 10cP (check fluid-property tables). Make sure this procedure doesn't heat up the system more rapidly than manufacturer recommendations. &#149 Avoid rapid shutdowns. Allow fluid to circulate until the heater-outlet temperature is a maximum of 250&#176F. &#149 Maintain system instrumentation. Failure of high-temperature or low-flow alarms not only can cause overheating but also can create potential for equipment fires. &#149 Check combustion chamber. Improper flame propagation or burner alignment can cause hot spots on tubes.

Oxidation

Fluid oxidation can create significant equipment problems. In many cases, fouling and corrosion of the expansion tank are the first signs that a problem exists if

routine fluid analyses have not been performed. Oxidation can be minimized in the following ways. &#149 Examine expansion tanks. Smoke emitting from an expansion-tank vent line is usually a sign that the tank is too hot. Install either a cold seal pot on the tank vent or blanket the tank with low-pressure inert gas. Never continuously operate a system with the warm-up valve open. On a vented system, the tank and lines leading to it should be left uninsulated. A thermal loop seal, reduced-diameter piping (1/3 main pipe diameter) between the expansion tank and main loop or thermal buffer tank will reduce thermal currents. &#149 Maintain positive net-pump suction head. High vacuum due to flow restrictions, such as a plugged strainer, can allow air to be sucked into fluid and cause excessive pump-seal wear.

Contamination

Contaminants can promote fluid degradation as well as cause operational problems. Contaminants can enter the system in the following ways. &#149 New systems Ensure that all fabrication debris (mill scale, weld spotter, slag) or protective coatings are removed before assembly. Pressure test the system with either heat transfer fluid or inert gas. Never pressure test with water. &#149 System cleaning Complete draining from all system low points is required when using organic-based solvents or flushing fluids. At least one full charge of fresh heat transfer fluid should be used to flush the system if complete draining is not possible. Water-based cleaners must be completely rinsed from the system with fresh water. Residual water should be removed by draining and then purging with hot, dry nitrogen down to a -20&#176F dew point or by vacuum. Boiling off residual water in the expansion tank should be minimized since it can cause fluid degradation. &#149 Daily operation Always use fresh fluid to top off the system. Fluid "burped" out the vent or collected in drop pans should be discarded. Don't mix fluids.

Fluid Handling

The following recommendations can ensure ease of filling, topping off and system recharging. &#149 Compensate for high humidity. If you're in a high-humidity environment, consider not filling your system with partially filled drums of fluid. Humid air can work itself into partially filled drums and develop condensation inside, which is then added to your system. &#149 Evaluate storage. Drums should be protected from exposure to direct sunlight and/or precipitation. It is possible for a sealed drum to draw in water as the fluid inside expands and contracts due to the outside temperature. The best way to prevent this from happening to drums stored outside is to store drums on their side or place a block underneath to tip them slightly, and prevent the bongs from sitting in water when it rains. &#149 Examine system filling. To prevent condensation due to temperature and humidity extremes, sealed drums should be moved inside at least 24 hours before the system is filled. This will allow fluid to adjust to room temperature. Add virgin oil to the system at the low point drain. It's preferable to add fluid on the suction side of the pump with a secondary pump. Do not use the system pump, which could be damaged if the pump runs dry. *Mark E. Smith is general manager of MultiTherm LLC, 3223 Phoenixville Pike, Malvern, PA 19355, a leading supplier of non-hazardous and non-toxic heat transfer fluids. Questions about this article can be directed to him at 610-408-8361 or* Msmith@MultiTherm.com *[1]. Additional information is available at*

www.MultiTherm.com *[2].*

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