Bulk and Film Temperature Impact on Heat Transfer Fluids

The transfer of heat is normally from a high temperature to a lower temperature object. Typically, during normal operation, thermal fluid systems, heat transfer takes place by all three means — Convection, Conduction, and Radiation. The first by forced convection of the heating media by a circulating pump. Convection is heat transfer by mass motion of the fluid when the heated fluid is caused to move away from the source of heat, or heater, carrying energy with it to the source it is targeting to heat. The second by conduction of the heat from the heating fluid through the tube wall to the media being heated. Finally, by radiation, from heat being emitted by the tube wall that was heated by Heat Transfer Fluid to heat up the targeted media.

The flow rate of the Heat Transfer Fluid or media is used for determining the highest temperature occurring in the heating system. This temperature occurs in the heater. It is important to maintain a high flow rate by convection inside the heating tube. This will reduce the difference between the wall/tube Film Temperature and the Bulk Temperature of the Heat Transfer Fluid while being able to maintain a high heat transfer film coefficient.

The maximum Bulk Temperature is the Heat Transfer Fluid's highest average temperature and will usually take place at the exit of the fluid heater. Thermal degradation of the Heat Transfer Fluid will double for every 18°F to 20°F increase in the Bulk Fluid Temperature. This could result in the Heat Transfer Fluid's life being cut in half by operating nearly 20°F above the maximum rated Bulk Temperature. By lowering the temperature similar degrees would cut the degradation rate of the fluid in half. Therefore, small changes in temperature can have major impact on the Heat Transfer Fluid's life at elevated temperatures. It is very important to see why accurately determining the thermal stability limit for a fluid is important, as well as operating at the appropriate Bulk Temperature of the Heat Transfer Fluid.

Also, Film Temperature is an important aspect of the thermal degradation rate of the Heat Transfer Fluid. Maximum Film Temperature is the highest temperature a fluid experiences in the system. Maximum Film Temperature normally is found adjacent to the tube wall at the heating surface, and typically averages 50°F (10°C) higher than the Bulk Fluid Temperature.
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In typical systems, between 15 to 25% of the total Heat Transfer Fluid degradation takes place in the film region. Consider also, if the flow rate of Heat Transfer Fluid decreases while the heat input remains constant, both Film and Bulk Temperatures will increase. This also results in less fluid mass being available to remove the heat transferred to the wall tubing. And because the film coefficient is almost linear with velocity, the Film Temperature will increase due to the decreased heat transfer efficiency. This will result in thermal degradation of the Heat Transfer Fluid as it reaches and surpasses the Film Temperature of the system.

In conclusion, it is important to understand the correct Bulk Operating Temperature of your fluid, as well as its maximum Film Temperature. Operating near or surpassing either condition can result in quicker degradation of your Heat Transfer Fluid.

For additional technical support call the MultiTherm® TechTeam at 800-225-7440.

MultiTherm® Introduces New Economical Heat Transfer Oil

MultiTherm® is offering a new economical alternative for Heat Transfer Fluid users. MultiTherm IG-1® is a Group II highly refined, hydro treated mineral oil designed primarily for use in closed heat transfer systems. MultiTherm IG-1® is designed for use in operations closed-loop systems that are equipped with expansion tanks, pressure relief valves and nitrogen blanketing. In properly designed systems it provides trouble-free, long lasting service to the end user.

MultiTherm IG-1® performs as an excellent Heat Transfer Fluid in numerous markets looking for an economical alternative for their industrial manufacturing processes. Common applications for MultiTherm IG-1®; heat transfer equipment used in manufacturing asphalt shingles and roofing compounds, road-paving equipment, die-casting industry, paper and particle board markets.

MultiTherm IG-1® offers the benefit of excellent thermal conductivity at high temperatures; low vapor pressure; and high Flash Point. The Thermal Stability from the oxidation resistant benefits reduces efficiency robbing components such as coke deposits and particulate build-up.

Finally, the longer oil life will mean less maintenance; less process downtime, less oil disposal and reduced environmental waste.

So, if you have an open-loop system or your expansion tank is open to atmosphere then MultiTherm OG-1® is the product for you.

MultiTherm® Introduces New Oxidation Resistant Heat Transfer Oil

MultiTherm® is offering the next generation of Heat Transfer Fluid for our growing base of Heat Transfer Fluid users.

MultiTherm OG-1® is a hydrocracked base oil combined with the latest proprietary oxidation inhibitor/stabilizer. MultiTherm OG-1® was designed to meet the rising and demanding requirements of open-system liquid phase heat transfer requirements.

MultiTherm OG-1® offers the benefit of excellent thermal conductivity at high temperatures; low vapor pressure; and high Flash Point. The Thermal Stability from the oxidation resistant benefits reduces efficiency robbing components such as coke deposits and particulate build-up.

Remember to Conduct Your Annual Fluid Analysis

Develop a Preventive Maintenance Program for your hot oil heater by annually conducting a Fluid Analysis on your Heat Transfer Fluid. MultiTherm TechTeam® can assist you call 800-225-7440.

Newsletters are available via e-mail. If you would like to receive them electronically, please contact us drop us an e-mail at TechInfo@Multitherm.com. Please include your name, company, address, phone numbers and e-mail address.