Proper System Startup and Shutdown is Important

Even though you may not realize it Proper System Startup is critical to your Heat Transfer Fluid. Significant damage to fluids - an equipment - can occur if the system is not started up properly.

Heat Transfer Fluids become less viscous as temperature increases. As the fluid gets thinner, its efficiency (heat transfer coefficient) increases dramatically.

Heat Transfer Fluids at lower temperatures of 120°F or less tend to have much higher viscosities and will not flow as efficiently. During startup, the cold fluid is not able to flow as well and absorb as much heat from the heater tubing compared to when it’s hot. It is important for the fluid to reach turbulent flow conditions for proper heat transfer conditions. If the temperature rises too quickly, the fluid film at the heated surface can begin to crack or thermally breakdown. This can result in the formation of low and high boilers in the system. This can eventually result in increased coking or higher vapor pressure over time. A system that has a repeated on and off cycles can result in continuous build up of degradation products in the oil and shorten life of the heat transfer fluid considerably.

In starting up, circulation should be started at ambient temperature then the heater raised to about 25°F above those conditions. The temperature should then be raised gradually in 25°F increments until the fluid reaches turbulent flow or till the heat transfer fluid reaches approximately 10 cP viscosity (check fluid property tables). Most fluids reach turbulent flow at approximately 180°F so at this point the temperature can be raised at a higher rate, approximately 50°F to reduce the impact to the Heat Transfer Fluid.

Just as a proper system start-up is important, it is as critical to shut your system down properly.

Normal conditions, the fluid should be operating at turbulent flow for ideal performance. The turbulent flow of the fluid minimizes the film and bulk temperature of the fluid while maintaining high film coefficient to allow for proper heat transfer through the tubing.

Should the Heat Transfer Fluid flow rate decrease while heat input remains constant, the film and bulk temperature will begin to rapidly increase. This is because there is not the fluid mass flow rate to transfer the heat through the tubing wall. This could result in raising the fluid temperature above its bulk film temperature resulting in thermal cracking of the fluid and further degradation of the oil.

To avoid this problem, the heater should be turned off while keeping the circulating pump running. The pump should be kept running until the heater outlet temperature has
reached 200°F (93°C) or lower. For additional technical support call the TechTeam at MultiTherm at 800-225-7440.

**Key Points in this Issue:**

- Proper Startup of Heat Transfer Fluids is important to reduce degradation of the oil.

- Start up by circulating fluid at cold near ambient condition followed by gradual increase in temperature in 25°F increments till fluid reaches 10 cP or turbulent flow at about 180°F.

- Proper Shutdown is just as critical to reduce degradation of the Heat Transfer Oil.

- The circulating pump should not be shutdown until the outlet temperature has decreased to 200°F (93°C) or lower.