AVOIDING OXIDATION

Oxidative Degradation (Most Common)

Oxidation occurs when heated fluid is exposed to air. It is one of the most common forms of degradation and can lead to the formation of sludge. While various heat transfer fluid chemistries oxidize at different temperatures, Duratherm fluids will normally start to oxidize above 93°C. It is also generally accepted that for every 15C° increase in temperature above 93°C, the rate of oxidation doubles.

Managing Oxidation

It is best to look for any point in the system where the fluid comes into contact with air. Start by looking at common areas of concern including expansion tanks and reservoirs. Once these areas are identified, measure the average fluid temperature in this area during normal operation. If the fluid temperature is below 93°C, the system should be safe from oxidation. If, however, the fluid is above 93°C, there are a few solutions you should consider to help minimize exposure:

1. If there is no external expansion tank or fluid reservoir, consider adding one at the high point of the system. Generally having a reservoir of cooler fluid at the point of air contact will help reduce oxidation.
2. If the system has an external reservoir, examine the flow path. If heated fluid is flowing through the reservoir, consider plumbing it so that the reservoir is branched off from the system and is not part of the circulating loop.
3. If the expansion tank is not part of the circulating loop but it is still running hot, you might try moving it further away or you may consider adding a nitrogen gas blanket to keep the fluid from coming in contact with air.

It is important to note that not all fluids are affected in the same way by oxidation. At Duratherm, we recognize that oxidation is a major downfall to heat transfer fluids and that is why all our fluids contain an extensive additive system to control and limit its effects.

DURATHERM

AVOIDING THERMAL DEGRADATION

Thermal Degradation

When a thermal fluid is overheated beyond its maximum bulk or skin temperature, the molecules start to break down and degrade or thermally crack into smaller, lighter molecules. Left alone, the reaction continues and these new lighter molecules may react with each other to form larger, heavier molecules over time.

Limiting Thermal Degradation

Beyond ensuring your fluid is the right one for your application's temperature, there are a few things to be aware of that can contribute to thermal degradation:

1. Start-up and shut down. We commonly see systems either being heated too fast or shut down abruptly without allowing the fluid to circulate and adequately cool. During start-up, particularly with electrically heated systems, it's important to heat the fluid gradually. This reduces the risk of thermal degradation and also ensures any moisture or vapors are vented from the system safely and without causing damage to any pumps.
   Shut down is equally important, particularly with electrically heated systems. If a system is not allowed to circulate and cool before shutting down the pumps, fluid can become trapped around the heat source and will likely be exposed to temperatures much higher than what the fluid is rated for.
2. Modifications to the original system design can also cause unexpected thermal degradation. A well-engineered system will utilize the heat transfer fluid as efficiently as possible without wasting valuable energy. This means that pumps, valves, heater watt densities, user loads, etc. are all engineered to work in harmony and within the original design parameters. Often, as the equipment gets older and needs change, it is likely that some aspect of the operation will need to be modified, added to, replaced or possibly even removed. If this is the case with your system, consult with equipment suppliers, engineers and fluid suppliers to ensure your system continues to operate efficiently and safely.