



## MAXIMIZING SERVICE LIFE OF THERMAL OILS IN EXTRUDERS

All thermal oils have a limit as to how long they can be effectively utilized in an extruder. The key factor affecting service life is mainly the type of fluid being used; however, process temperatures and production rates also play a role in determining the optimal length of time between fluid changes.

Selecting the right thermal oil – one intended for an extrusion application – is always the best place to start when trying to achieve maximum service life. While there are a variety of fluids to choose from, only a few fluids contain the additives necessary for a fluid to be able to withstand the demanding thermal cycles and air contact an extruder is subjected to day-in and day-out.

To keep an extruder running at peak production rates, it is vital that a fluid analysis program be implemented to track the life cycle of the thermal oil and determine a change-out interval best suited to meet the application's demands. We encourage all our customers to take advantage of our no-charge fluid analysis program as a way to measure and interpret fluid performance over time.

### Maximizing Fluid Life

All thermal oils degrade with time and if not changed at an appropriate interval, they will deteriorate to the point where they will start to leave deposits. The key is finding the right balance between maintenance schedules and production requirements.

To help understand the stress an extruder puts on a fluid consider this, the same fluid that would last possibly 3500 hours in an extruder application could last upwards of 12 to 15 years in a larger thermal oil system with no exposure to air.

There are a number of factors involved that lead to thermal oil breakdown but there are also some easy techniques that can be applied to maximize your fluid's in-service life.

### Thermal Oils Generally Breakdown In Two Ways: Oxidation Or Thermal Degradation

**Oxidation** starts to take hold quite rapidly when the heated fluid – with a temperature in excess of 93°C (200°F) – comes into regular contact with air. While oxidation is nearly unavoidable, this can be a major problem in reservoirs where the thermal oil is not suitably cooled before it's returned to the tank.

Heat exchangers are an integral part of the system loop as they help to keep the fluid in the tank at a manageable temperature to minimize oxidation – under the 93°C (200°F) threshold. If for some reason they get fouled on either the water or fluid side, their reduced efficiency can have a substantial impact on the tank temperature and consequently the fluid's service life. Regularly checking the tank or reservoir temperature with a temperature probe is the easiest way to determine whether your system's heat exchanger is operating efficiently.



## AVOIDING OXIDATION AND THERMAL DEGRADATION

**Thermal degradation** occurs when a system overheats the thermal oil past its maximum rated operating temperature. In most cases, with proper fluid this should not be a concern; however, there are a few circumstances where overheating could still occur.

During extended periods of idle operation, equipment is often left in a constant heat-only mode with the barrel heater bands left on to maintain barrel temperature – this is normal and expected during start-up periods and for short periods of idle time. If there is a need to idle the equipment for an extended period, the machine should not be left in a heat-only mode as this may leave non or slow-circulating fluid in the barrel wraps and exposed to high temperatures for far too long.

When shutting down the equipment, the thermal oil should always be allowed to cool before turning off the circulating pumps – this is key to preventing stagnant fluid from being trapped near heat sources and potentially overheating it. This is an especially important step to follow with the screw extruder's temperature control unit regardless if it is built-in to the extruder or a stand-alone portable.

After determining your thermal oil's life cycle, it's important to maintain regular fluid changes just as you would with your car in order to keep it running at it's best. As the fluid in your extruder ages it begins to darken and form acids as a result of oxidation. These acids are eventually what polymerize to form sludge within the system and negatively impact the extruder's overall efficiency.

### Proper Draining Techniques

When it does come time to change your thermal oil, it's important to remove as much fluid as possible from the system before refilling – this includes not only the reservoir but also circulation lines, filter housings, heat exchangers etc. If an excessive amount of degraded fluid is left in the equipment, it will contaminate anything new that gets added. This will immediately darken the new fluid and will speed up the degradation process, leading to a reduced service life for the new thermal oil.

An easy way to evaluate the efficiency of a fluid change is through a 'Before and After' analysis of the thermal oil. By comparing the 'After' sample's TAN (total acid number) to the 'Before' or degraded sample's, we can estimate the volume of thermal oil that was left in the equipment following the change-out.

### What To Do If You Don't Always Get To Your Thermal oil Changes On Time

If you have overextended the life of your fluid but have not yet begun to form deposits, a simple flushing fluid (available from Duratherm) can be used to help reduce the amount of residual fluid left in a system after draining. This reduces the potential of contamination when refilling your system with new fluid. If you have – or suspect you have – started to form deposits in your system, there are a few cleaning products currently available to assist in removing them. For example our DuraClean line of cleaners actually allow for production to continue to run uninterrupted while they work to break-up deposits. Otherwise, care should be taken to remove sludge build-up and residual thermal oil before refilling the system with in order to get the maximum service life and value from the fresh fluid.