Cleaning, Flushing, Draining and Charging Your Thermal Oil System

Recollect the Fluid
Recollecting fluid that has reached the end of its life with the same brand or a different brand requires an important decision—how much time and money do you want to spend performing this task? Make sure to consider process down time (including cooling, draining and filling), labor (including personal protection equipment) and disposal costs as well as the cost of the new fluid. Many fluids are compatible enough that a simple drain and fill is all that is necessary. Check with the new fluid supplier to be sure.

Cold Spots
You should consider using a system cleaner if there are cold spots in the system. Completely plugged lines will probably have to be replaced since only water-based cleaners will unplug lines. If there is any flow through the affected area, non-aqueous cleaners will generally work. There are two types of cleaners. Additive cleaners are added to the existing fluid and clean while the system continues to operate. Once all of the lines are hot again, the system is drained and recharged. Other cleaners are designed for faster “off-line” cleaning but require an additional flushing step to remove the cleaner. Make sure the cleaner is compatible with your fluid.

Fluid Removal
If you’re very lucky, there are drains located at all low points of the piping so that the fluid can be easily drained or pumped out. Otherwise, be prepared to break flanges, open pressure taps or remove valves, flex hoses, or other components from the piping to ensure complete fluid removal. Using compressed nitrogen to force the fluid out one end of an open loop is tricky to implement but effective.

Draining the system warm/hot will leave less fluid and solids in the lines than draining it cold. Shut the heater down and continue to run the pump until the fluid has cooled to between 150 °F and 180 °F and then drain as quickly as possible.

Flushing Fluids
Flushing fluids are typically high-solvent-content liquids whose only real purpose is to dilute existing fluid that is too viscous at ambient temperature to completely drain from the system. Unlike a cleaner, a flushing fluid will not remove system deposits. It also adds 2 additional steps because the flushing fluid must be flushed out of the system to prevent premature degradation of the new heat transfer fluid. Your new fluid supplier should be able to tell you whether or not you need to flush.

NOTE—New systems rarely need to be flushed prior to filling. The main contaminants in any new system are typically leftovers such as welding slag, metal particles, shop rags, or other solids. These can be removed with a 60-mesh start-up strainer during initial circulation. In new piping, the amount of soluble contaminants such as lacquers, oils or other metal coatings present is very small relative to the system volume. You will reduce the heat transfer fluid’s life more by incompletely flushing out the flushing fluid itself—to say nothing of the extra time and disposal costs.

Charging & Initial Run
Do not use the main circulating pump to charge the fluid since this can damage the seals. Use a stainless braided Teflon hose to connect a small positive displacement pump as close as possible to the main pump suction. Open all control and block valves and high point vents (make sure to place a bucket under the vents to catch fluid as it runs out, and that you have enough workers on hand to monitor the vents). If the system does not have a dearator, make sure the warm-up valve to the expansion tank is open. Add fluid until the expansion tank is about 1/2 full. If (Continued on next page)
the expansion tank level is hard to
determine, look for overflow from the
expansion tank vent. Next almost
completely close the main pump
discharge block valve. Start the
pump and open the block valve to 1/4
of full flow. Add more fluid as needed
when the low-level switch trips or
the pump starts to cavitate. Once the
fluid is circulating steadily thru the
entire system, open the discharge
valve another small increment,
adding fluid as necessary. The
system is full when the pump runs
steadily with the block valve fully
opened. Check all of the high level
vents to make sure that the lines are
filled. Add fluid to reach the proper
level in the expansion tank.

Start-up

When it turns to steam, 7 ounces
of water will force 55 gallons of
possibly very-hot fluid through
the expansion tank vent. So every
cold start up (for new or existing
systems) should be approached with
the conviction that there is water
somewhere in the system. While
draining the low points on the piping
can remove gross amounts of water,
the only method that will completely
remove all of the water is to flash
expansion-tank vent. For this to
occur as quickly as possible –
1. The expansion tank temperature
must be maintained over 212°F.
2. Condensation of the steam inside
the tank must be minimized.

Warm-up/vent lines (which
run from the heater outlet to the
expansion tank) are the most
effective setup. Deaerators do an
excellent job of separating air and
other non-condensing gases from
fluid but are almost worthless for
venting gases that condense (like
steam).

**NOTE: Contact your heater
or fluid manufacturer if you are
unsure how to boilout
your system.**

Some things to do before
you start:
1. If the expansion tank vent
discharges into a catch tank, make
sure that you can see the end
of the pipe. Also make sure the
system catch tank is completely
empty.
2. Open the manual valve on the
expansion tank vent line.
3. If you have a nitrogen blanket on
the tank, set the nitrogen inlet
pressure control valve as low as
possible to provide a continuous
purge thru the vent—this will
prevent oxidation of the fluid and
also speed up water removal.
4. Open all control valves.
5. Lay welding blankets on top of
the expansion tank to reduce
condensation.

Start the heater and increase the
setpoint slowly to 220°F. Pump noise
or pressure fluctuations, crackling or
popping noises and/or sudden level
changes in the expansion tank are
all signs that you have water in the
fluid. At this point, steam should
be coming out of the vent. When
the steam stops, increase the outlet
temperature another 3°F and allow
steam to vent. Continue to increase
the temperature by 3°F increments
until the fluid temperature at the
pump suction has reached 220°F
and the pressure is steady. Close
the warm-up valve and slowly
increase the heater temperature to
the desired operating temperature.
Check the fluid level in the
expansion tank and close the vent
if the tank has a nitrogen blanket.
Remove any insulation you may have
placed on top of the expansion tank.
Drain some fluid from the any low
points in the expansion tank and/
or thermal buffer tank and check for
water. If everything looks good, you
are done.

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**Questions?** We’d like to hear from you. Call toll-free, +1 800-222-3611, or fax or e-mail us,
or visit our website, [www.paratherm.com](http://www.paratherm.com).

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