

Thermal Fluid System Clean Out

At some point, a hot oil system may require a system cleanout due to ongoing excessive maintenance and/or operating problems, which cannot be rectified by simply replacing the fluid. In planning a system cleanout, users should consider the following issues:

- Number and location of system drain points
- Time frame available for cleaning or changeover
- Condition and compatibility of existing fluid
- Your manpower to perform the work

There are enough differences with each system and situation to make a single detailed procedure impractical or even incorrect for some cases. Several general options are presented below. Contact MultiTherm's TechTeam at 1-800-225-7440 to discuss which procedure best fits your needs.

OPTION 1: Flush with MultiTherm Heat Transfer Fluid or MultiTherm FF-1® Flushing Fluid

Procedure suggested for use when:

- System is not badly fouled
- Fluids are chemically compatible
- System is not difficult to completely drain
- Time is short

Procedure:

1. If possible filter existing fluid using 40 microns or smaller to remove particulate from the system which might not drain out with the fluid during the draining process.
2. Run system at 225°F/108°C to 250°F/122°C (or just below the flash point) to mix well and suspend all the loose particulate in the thermal fluid.
3. Stop the heater and allow the temperature to drop with the circulating pump going.
4. Allow the system to cool to an acceptable temperature, stop the system pump and drain the thermal fluid quickly from all low points. If insufficient drains exist to remove 85-90% of fluid, install some hot tap drains at low points prior to trying to drain the system – for advice on this, please contact your TechTeam representative.

   NOTE: *Personnel should exercise appropriate caution when working around hot fluid – remember that Safety Comes First. The benefit of hot draining is that it prevents sludge and tars from re-depositing in the system.*

5. Recharge the system 100% with either MultiTherm Heat Transfer Fluid or MultiTherm FF-1 Flushing Fluid from all the low point drains to prevent air pockets from developing.

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If there are system high point vents, open them and fill the system until oil comes out & close them. Start the circulation in the system without heat to help remove any air pockets – you will hear them working their way into the expansion tank. When all air pockets are removed, apply heat.

- If using *MultiTherm FF-1*, circulate for a maximum of 72 hours above 200°F /94°C or at operating temperature. 400°F/205°C is ideal and can be ran up to 600°F/316°C. Reduce heater outlet temperature to 225°F/108°C at end of time prior to draining out fluid to ensure smooth removal of all fluid and particulates gathered with the Flushing Fluid.

- If using *MultiTherm Heat Transfer Fluid*, run at production temperature and take a sample after 1 day of operation. Send the sample in for an analysis to determine how much longer you need to run before draining.

6. Turn off the heater and allow the temperature to drop while keeping the circulating pump on. When at an acceptable temperature, stop the system pump and drain quickly.
7. Recharge the system with new MultiTherm Heat Transfer Fluid and restart. Take a fluid sample within 1 week of start-up and send to MultiTherm for a fluid analysis.

OPTION 2: Flush with MultiTherm PSC Plus® Process System Cleaner and/or MultiTherm FF-1® Flushing Fluid

Procedure suggested for use when:

- Fluids are not compatible and different type of Heat Transfer Fluid is used
- System has some particulate and loosely adhering carbonaceous deposits
- System is badly sludged up or flow is restricted in some areas

Procedure:

1. If possible filter existing fluid using 40 microns or smaller to remove particulate from the system which might not drain out with the fluid during the draining process.
2. Run system at 225°F/108°C to 250°F/122°C (or just below the flash point) to mix well and suspend all the loose particulate in the thermal fluid.
3. Stop the heater and allow the temperature to drop with the circulating pump going.
4. Allow the system to cool to an acceptable temperature, stop the system pump and drain the thermal fluid quickly from all low points. If insufficient drains exist to remove 85-90% of fluid, install some hot tap drains at low points prior to trying to drain the system – for advice on this, please contact your TechTeam representative.

   NOTE: *Personnel should exercise appropriate caution when working around hot fluid – remember that Safety Comes First. The benefit of hot draining is that it prevents sludge and tars from re-depositing in the system.*

5. Fill system with MultiTherm PSC Plus® Process System Cleaner and/or MultiTherm FF-1® Flushing Fluid.

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- If using *MultiTherm PSC Plus*, add anywhere between 4% to 20% (depending on how badly degraded the fluid is in the system) to the existing fluid by using a secondary pump to add MultiTherm PSC Plus on the suction side of the system pump. Do not add in through the expansion tank. Circulate for a maximum of 48 hours at operating temperature or up to 600°F/316°C. Reduce heater outlet temperature to 225°F/108°C at end of time prior to draining out. This is to ensure smooth removal of all fluid and particulates. If the system fluid has been severely degraded, we recommend recharging the system with MultiTherm FF-1 per the below.

- If using *MultiTherm FF-1*, recharge the system 100% and circulate for a maximum of 72 hours above 200°F/94°C or at operating temperature. 400°F /205°C is ideal and can be ran up to 600°F/316°C. Reduce heater outlet temperature to 225°F/108°C at end of time prior to draining out MultiTherm FF-1 to ensure smooth removal of all fluid and particulates gathered with the Flushing Fluid.

  NOTE: *When recharging your system, fill from all the low point drains to prevent air pockets from developing. If there are system high point vents, open them and fill the system until oil comes out & close them. Start the circulation in the system without heat to help remove any air pockets – you will hear them working their way into the expansion tank. When all air pockets are removed, apply heat.*

6. Turn off the heater and allow the temperature to drop while keeping the circulating pump on. When at an acceptable temperature, stop the system pump and drain quickly.
7. Recharge the system with new MultiTherm Heat Transfer Fluid and restart. Take a fluid sample within 1 week of start-up and send to MultiTherm for a fluid analysis.

OPTION 3: PROFESSIONAL CLEAN OUT

If you do not have the manpower, equipment or you have special clean out requirements – there are companies like COT-Puritech that can provide all the professional manpower and equipment to clean out your system per the above procedures to meet any specific requirements.

If your system requires a chemical clean out, there are companies such as Haliburton, Oakley Service Co. and Schlumberger that have this type of specific experience.

Typical Procedure

1. Water-borne cleaner, frequently based on inhibited phosphoric acid or sodium hydroxide with surfactants; solvents, and/or chelates, or sodium hydroxide with potassium permanganate.

   Note: *Caustic cleaners are hard on copper, aluminum and their alloys.*

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Chlorinated solvents such as 1, 1, 1, trichloroethane or perchloroethylene should not be used due to the potential for environmental damage or system damage from residual solvent.

2. Flush with plenty of water. (Please note all water needs to be moved with Dry-out procedure or air prior to start-up)
3. Final rinse may contain inorganic rust inhibitor.
4. Drain system hot.
5. Dry-out with hot nitrogen (air is 2nd choice) to a -20°F/-29°C dew point (with the help of vacuum).

Time - A common mistake is to try to squeeze a clean out into a weekend with a Monday morning production start-up. This is practical only for small, non-complicated systems. Considerable time at temperature is required for cleaning. Good flushing is not done quickly. When using the chemical clean out procedure, proper dry-out prevents the necessity of several weeks of boil-out with accompanying pump cavitation problems and an angry production department.

Pump & Seals - For Options #1 & #2, the cleaning fluids are compatible with the system components. When using the chemical clean out procedure, the pump and seals on heat transfer fluid systems are made for organic heat transfer fluids and will probably not be satisfactory for water-borne cleaners. An auxiliary pump will probably be required.

Disposal - Uncontaminated MultiTherm heat transfer fluids can be taken by a waste oil hauler (oil recycler) and disposed of like used motor oil. Hazardous waste handling is not required except in a few locations where used lubricating oil is also classified as hazardous. A contaminated fluid must be handled according to what contaminated the oil. Check local regulations. Some cleaning service companies also arrange for fluid disposal as part of their service.

Walk the System After Cleaning - It is recommended that you walk the system after cleaning out the particulate and sludge in your system. Carbon particles can fill small pin holes caused by rusting from the outside in on the pipes and with the cleaning these particles can be removed which will leave you with some heat transfer oil seeping out. When using Options #1 & #2, this is rare but can happen. When you use the chemical clean out procedure, you will definitely see this happen and should expect to weld up any of these tiny holes and re-weld any welded joints. The chemicals that are used are so aggressive and do such a good job that they remove all carbon off the pipes and internal components.

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