



GUIDELINES FOR HEAT TRANSFER FLUID CHANGE-OUT

The key to a safe and successful heat transfer fluid change out is careful planning and preparation.

Prior to starting the change out process, please take the time to carefully read through these guidelines as well as the fluid change out procedures provided by the heat transfer system provider. Also ensure that personnel involved are fully briefed on the safety precautions they should take during the fluid change out process.

1. Review health and safety information.

Ensure all personnel involved review and understand the health and safety precautions outlined in the Material Safety Data Sheets (MSDS) for Petro-Canada Cleaning and Flushing fluids, and the new Petro-Canada heat transfer fluid.

2. Sample and analyze the current heat transfer fluid.

Take a representative sample of the current heat transfer fluid from the system using Petro-Canada's fluid sampling kit. Petro-Canada's Technical Services Department will analyze the sample to determine the condition of the fluid. This analysis will help to determine if additional cleaning and flushing procedures are required, or if extra caution should be exercised during fluid change out.

To obtain more information about this sampling program, contact your Petro-Canada representative and ask for our technical bulletin (TB-1200 Petro-Canada's Heat Transfer Fluid Sampling Program).

3. Pre-inspect the heat transfer system.

Inspect the entire heat transfer system to identify:

- fluid draining and refilling points
- low points and dead-legs that require special attention during the fluid draining process
- how the expansion tank will be inspected and cleaned
- problem areas that should be addressed before refilling (these can include leaks at pump seals and flanges, or areas where the heating fluid has soaked into the insulation)

Safety precaution: before removing insulation soaked with heat transfer fluid, ensure that system piping is cool enough that it is safe to do so.

Schedule system repairs to coincide with fluid draining.

4. Drain the system.

Turn off the heater (usually 24 hours prior to draining) and continue to circulate the heat transfer fluid until its temperature is low enough that it can be safely drained, typically 50°C (120°F) or lower.

If the expansion tank has a nitrogen blanketing system, turn this system off.

Turn the fluid circulating pumps off just before draining the fluid to prevent system contaminants such as water, carbon and sludge from settling.

Drain the bulk of the fluid from the lowest point in the system.

For larger systems:

- consider the use of a bulk waste oil tanker with a suction system to quickly remove and properly dispose of the previous heat transfer fluid

What is the HT difference?

Petro-Canada starts with the patented HT purity process to produce water-white, 99.9% pure base oils. The result is a range of lubricants, specialty fluids and greases that deliver maximum performance for our customers.



For smaller systems:

- gravity drain or pump the previous heat transfer fluid into drums
- dispose of the fluid per local regulations and the recommendation of the fluid supplier

As the fluid level drops, progressively open vent valves to aid the draining process. Once the bulk of the fluid has drained, open low points, dead-legs, bottom loops and long pipe runs where fluid may have settled.

The system should be left to drain for as long as possible. Overnight draining is recommended where practical.

Safety precaution: drums or pails should be placed beneath all drain points to contain residual fluid and must be regularly monitored to avoid overflow.

Note: While 'blowing down' the system with compressed nitrogen or air can facilitate faster and more complete draining, care should be taken to safely connect air / nitrogen supply line to the down-pipe below the expansion tank.

Do not "blow down" through the expansion tank as sludge and deposit contamination within the tank may be forced into the heat transfer system.

5. Inspect and physically clean the system.

When the fluid has drained, thoroughly inspect and clean the system.

All heat transfer surfaces should be checked for fouling, with extra attention to the:

Expansion Tank

The expansion tank is the most likely location for the build up of system contaminants:

Disconnect the tank from the downpipe to the ring main system. Open the drain tap (if fitted) and any other connections on the bottom of the tank. Use empty drums or pails to collect residues.

Safety precaution: the down-pipe and other expansion tank connections may be blocked with sludge. Care must be taken to avoid a delayed fluid spill after disconnecting the tank.

Inspect the inside of the tank via the inspection cover. If no cover exists, access may be possible by removing the level gauge or any other practical means of access.

Remove any sludge, carbon and solid residues found in the tank. Physical removal through scraping will remove the bulk of contaminants. If available, a steam cleaner is ideal for thorough tank cleaning.

Flush the tank with a small quantity of Petro-Canada Flushing Fluid, or the CALFLO Heat Transfer Fluid that will be used to recharge the system. Ensure that this fluid is completely drained and properly disposed of after flushing.

Vent Pipe System

The vent pipe system allows volatile compounds to escape during operation and is an important system safety device. As such, it must be inspected and cleaned to ensure safe operation in the future:

Physically remove any sludge, carbon and solid residues from the vent pipe.

If the system is vented to the building's exterior, pay careful attention to the 90° bend on the outside wall. This bend is used to prevent rain and moisture from entering the system.

Also pay careful attention to flame traps, added to venting systems to prevent volatile compounds from igniting during a lightning strike.

Heat Tube Bundles

Thermally stressed fluids may have coked upon contact with heating tubes, leaving tightly adhering hard carbon deposits. Mechanical cleaning or aggressive chemical cleaning agents may be required to remove these deposits.

The integrity of tubes in gas fired heaters should be checked at this time.

Heat Exchange Equipment and Filters

Physically remove any sludge, carbon or solid build-up.

6. Clean and flush heavy fouled systems with Petro-Canada Cleaning and Flushing Fluids.

Petro-Canada Cleaning Fluid and Petro-Canada Flushing Fluid are designed to clean fouled heat transfer systems of deposits, resins and sludge, and flush out system contaminants including residual fluids, process chemicals, water and debris. They can help to restore a system to its optimum condition, maximizing operation efficiency and lower operating costs.

For more information about cleaning and flushing your heat transfer system, contact your Petro-Canada representative and ask for our technical bulletin (TB-1158 Guidelines for Cleaning and Flushing a Heat Transfer System).

7. Refill the system with CALFLO Heat Transfer Fluid.

Refill the system, from its lowest filling point, leaving all vents open to remove air or non-condensable gases. Close the vents, in turn, as fluid appears at each vent.

Fill the system to the OEM volume guidelines for proper operation.

Safety precaution: while a common practice is to fill a system with cold fluid until the expansion tank is 25% full, this assumes that the tank has been properly sized to accommodate twice the expected volumetric expansion of the fluid when hot. The capacity of the expansion tank relative to the total capacity and operating conditions of the system, and the coefficient of thermal expansion of the fluid must be verified when filling using this method. Petro-Canada Technical Services can assist with these calculations and recommend the appropriate fluid volume for the heat transfer system.

Turn on the circulation pumps. Maintain system fluid levels by topping up with additional fluid as necessary. Closely monitor strainers and filters and clean as necessary.

Continue fluid circulation **without heating** for 2 to 4 hours (or overnight) to ensure the removal of air trapped in the system. Frictional heat may raise the fluid temperature by 25°C to 40°C (75°F to 100°F).

NOTE: pump cavitation noise (intermittent rumbling) may be heard as trapped air circulates with the fluid. If pump cavitation persists, remove the trapped air by carefully opening a system vent valve.

For systems without a built-in fluid sampling point:

- Take a representative fluid sample from the system using Petro-Canada's fluid sampling kit. Petro-Canada's Technical Services Department will analyze the sample to confirm new fluid's condition and to establish an operational baseline for comparison to future fluid samples.

When applicable, establish a nitrogen blanket on the system.

8. Carefully bring the system up to operating temperature.

Switch on the heater and slowly raise the heat transfer fluid temperature to between 102°C and 107°C (215°F and 225°F) and hold to vent off steam generated from moisture with the system. Moisture can result from steam cleaning, chemical cleaning, hydrostatic testing, or condensation during shutdown. Care must be exercised to completely remove moisture from the system, as a rapid release of trapped steam or rapid vapourization of free water entering the expansion tank can cause an expulsion of hot fluid, creating a serious safety hazard.

NOTE: pump cavitation noise (intermittent rumbling) may be heard as water vapour is circulated with the fluid. If this pump cavitation causes a pressure drop that automatically shuts down the system heater, allow the system to cool and commence the heating process again.

When all moisture has been vented, continue heating the heat transfer fluid to its approved bulk operating temperature. The expansion tank should be no more than 75% full at this temperature.

Safety precaution: the fluid level in the expansion tank should be regularly monitored during fluid heating to confirm that the tank is not undersized and prevent fluid overflow.

Perform a comprehensive check of the system to ensure that the system is operating safely and efficiently, with no fluid leaks.

For systems with a built-in fluid sampling point:

- After 24 hours, take a representative sample of the fluid from the system using Petro-Canada's fluid sampling kit. Petro-Canada's Technical Services Department will analyze the sample to confirm that the sample is not contaminated and to establish an operational baseline for comparison to future fluid samples.

Check filters and strainers on a frequent basis during the first few weeks of operation and clean as required.

9. Check the new fluid's condition after 6 months of operation.

After six months of operation, take a representative sample of the new heat transfer fluid from the system using Petro-Canada's fluid sampling kit. Petro-Canada's Technical Services Department will analyze the sample to determine the condition of the fluid versus the base line sample taken during the initial fill. This analysis will confirm the fluid's condition under actual operating conditions.

TechBulletin Info Lines

If you would like to know more about Petro-Canada's Heat Transfer Fluids, or any other product in our complete line of quality lubricants, please contact us at:

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