

THERMINOL[®]
from Eastman

THERMINOL[®] FF

flushing fluid

Restoring high performance to
heat transfer fluid systems



THERMINOL® FF

flushing fluid

Eastman Therminol® FF flushing fluid is a key component of a low-cost alternative to chemically cleaning a heat transfer system containing severely degraded or contaminated organic heat transfer fluid. Deposits from oxidized, thermally degraded or contaminated fluid can foul interior surfaces, making it necessary to clean the system prior to charging with new fluid.

Therminol FF is available globally. Contact your local Eastman Therminol sales representative for more information.

Performance

- **Fast and easy**

Using Therminol FF to flush your fouled system is faster than chemical cleaning and requires less downtime. This is because you simply drain the old fluid, add Therminol FF, circulate the heated fluid, and drain and refill with your new heat transfer fluid.

- **Compatible with system components**

Mechanical components used in most high-temperature heating systems that use organic heat transfer fluids are generally compatible with Therminol FF. This includes piping, flanges, gaskets, pumps, valves and valve packing, filters, and insulation. Using Therminol FF as a cleaning fluid should not compromise performance or cause harm to the integrity of these system components. A bulletin showing specific compatibility ratings with common materials is available.

- **Compatible with new heat transfer fluid**

Therminol FF is compatible and miscible with most organic heat transfer fluids, which means less downtime is required for system cleaning. Water-based cleaning solutions add costly drying time to a cleanout procedure, creating additional chances for contamination. Therminol FF eliminates drying time, significantly reducing the duration of the procedure. The system can be refilled immediately.

- **Safe and effective**

Therminol FF is a synthetic hydrocarbon with a high flash point and high initial boiling point, making it much safer to use than other cleaning solvents. Due to its high boiling point, Therminol FF can be safely heated while circulating in the system to increase its strong solubilizing capacity and overall effectiveness as a cleaning fluid. For more information on safety precautions and personal protective equipment (PPE), download the safety data sheet (SDS) from therminol.com.

Typical properties^a

Appearance	Amber liquid
Composition	Synthetic hydrocarbon
Flash point, COC (ASTM D92)	>120°C (250°F)
Fire point (ASTM D92)	>130°C (270°F)
Boiling range (ASTM D20)	230°–343°C (450°–650°F)
Viscosity @ 25°C	2–6 cSt
Density @ 25°C	0.96–1.00 g/cm ³
Moisture content, maximum (ASTM E203)	500 ppm

^aThese data are based on samples tested in the laboratory and are not guaranteed for all samples. Contact us for complete sales specifications for Therminol FF fluid. Does not constitute an express warranty. See disclaimer on the back page of this brochure.

Heat transfer system cleaning with Therminol FF

When performance of a heat transfer system decreases due to fouling or the solids level in the fluid is too high for effective filtration, a cleanout may be necessary to restore the system to peak operating performance. Sludge and solids are often the result of process contamination or decomposition of the heat transfer fluid through oxidation or overheating.

To help you decide on the correct cleanout procedure, Eastman can provide a no-charge fluid analysis to determine the extent of degradation or contamination. These test results can then be used in developing the parameters required to maximize the effectiveness of Therminol FF as a cleaning fluid in your system.

A general system cleaning procedure follows, but each system and situation can be different. Consult your Therminol specialist and system designer while planning the cleaning of a heat transfer fluid system.



To request a fluid sample analysis, visit the "Heat transfer services" page on therminol.com. Click "Request a free kit" and fill out the form to receive a free fluid sample collection kit.

Draining the system

The system should be circulating, and the temperature of the degraded heat transfer fluid heated or cooled to no more than 93°C (200°F).

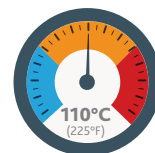
The heater should then be shut down, and the main circulating pump allowed to run so that loose solids and sludge will be fully suspended in the degraded heat transfer fluid. Pump out the used fluid and drain through all available low-point drains. Caution should be taken to avoid contact with the hot fluid and its vapors. All fluid removed from the system should be handled in accordance with measures listed in the SDS for that fluid.

In areas of the system where gravity draining of the fluid is not effective, such as heater coils or horizontal users, blowing the piping with nitrogen can help remove excess fluid. It is important to remove as much of the degraded heat transfer fluid as possible to maximize the effectiveness of the Therminol FF flushing fluid in cleaning interior surfaces of the system.

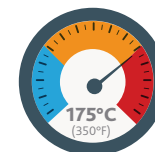
Flushing the system

Introduce Therminol FF into the system to a normal liquid level for cold system start-up, including the expansion tank where solids tend to deposit. Next, circulate the entire system at ambient conditions to thoroughly mix Therminol FF with any residual fluid left in the system. Check the return-line strainer periodically for plugging from solids, which may have been removed from the fouled heat transfer surfaces. For larger systems capable of isolating sections, less Therminol FF can be used by flushing one section at a time as long as the expansion tank is not isolated from the circuit.

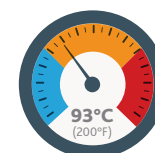
1. Gradually, heat the circulating fluid to about 110°C (225°F) and vent any moisture that may have entered the system through the vapor space of the expansion tank.



2. When all the moisture has been vented, continue heating the circulating fluid to no more than 175°C (350°F) to maximize the solubilizing characteristics of the Therminol FF. Allow for thermal expansion of Therminol FF when heating. Typical volume expansion from ambient to 175°C (350°F) could be about 10%–12%. Full circulation of the entire system should be maintained at no more than 175°C (350°F) for 16–24 hours. Ensure flow through all circuits.



3. Cool the fluid to 93°C (200°F), and then repeat the draining procedure. Lower draining temperatures are recommended for reduced exposure to vapors and hot fluid.



Heat transfer refill and system start-up after cleaning

Once the system has been completely drained of as much Therminol FF as possible, visually inspect the system in areas of low fluid velocity to check for solids which may have fallen out of suspension. Any solids found should be removed. If the system does not have a side-stream filter to continuously remove solids during normal operation, installing one should be considered prior to charging the new heat transfer fluid.

The refill and start-up of the system with new heat transfer fluid should follow the same procedures used in previous start-ups. Care should be taken to vent any moisture that may have entered the system during flushing, draining or refilling. Small amounts of Therminol FF remaining in the system are not expected to have an adverse effect on the operation or service life of the new fluid. However, a portion of the Therminol FF flushing fluid "heel" can be vented from the expansion tank to a safe location using routine venting procedures.

Therminol FF is not regulated under DOT and, when mixed with spent heat transfer fluid, can meet the criteria for a synthetic used oil under the U.S. EPA Standards for Management of Used Oil (40 CFR 279), which governs recycling and disposal of used oil.

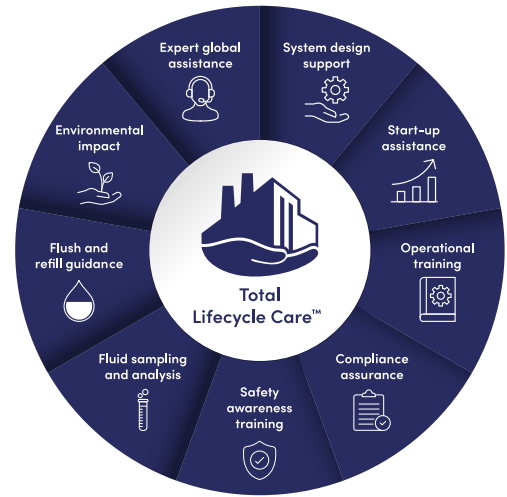


For the technical service contact in your region,
visit the "Contact" page on therminol.com.

Total Lifecycle Care™

Total Lifecycle Care is a comprehensive service that uses analytics, sampling and training to prevent heat transfer system failures, ensuring safe, efficient and uninterrupted operations.

- Offers industry-leading technical support
- Provides data through Fluid Genius™ for informed decision-making
- Helps minimize unexpected downtime and maintenance costs
- Assists in maximizing fluid life
- Enables safe working environments through tailored safety training
- Helps keep systems running smoothly



Comprehensive support services

- **In-service heat transfer fluid sample analysis**

Eastman provides comprehensive testing services to extend heat transfer fluid life and ensure system performance by detecting contamination, moisture and degradation through key tests like acid number, viscosity, insoluble solids and moisture content.



- **Fluid Genius™**

Fluid Genius is a web-based portal and sampling service that simplifies fluid sample management by providing expert analysis, fluid condition monitoring, lifespan prediction, early maintenance alerts, technical support and access to a comprehensive knowledge base. Learn more at fluidgenius.net.



- **Compliance support**

Our team provides guidance to help you achieve and maintain regulatory compliance related to safety, health and environmental standards, ensuring your operations meet the necessary requirements.



- **Environmental impact**

Eastman supports your sustainability goals by advising on waste heat recovery and water-lean utility deployments using Therminol products to reduce CO₂ emissions and water consumption.



Operational and safety awareness training

- **Operational training**

Eastman's customized training programs improve expertise in fluid selection and heat transfer system operation for technicians, supervisors, maintenance staff and engineers through core and specialized sessions to enhance design, improve safety and reduce costs.



- **Safety awareness training**

At Eastman, we approach safety with a zero-incident mindset. We offer our customers safety awareness training that focuses on the design start-up, operation and maintenance of heat transfer fluid systems to help ensure safe, efficient operations.



- **Expert global assistance**

Get direct access to experienced technical service specialists who can help answer questions regarding heat transfer fluid selection, system start-ups, system design and operational issues.



Operational efficiency

- **System design support**

Eastman collaborates with leading manufacturers to provide expert support in heat transfer system design, performance, fluid selection, and compliance, offering seminars, technical visits, and on-site audits to improve system reliability and efficiency.



- **Start-up assistance**

Eastman offers start-up assistance by reviewing procedures and recommending improvements to streamline systems and reduce common issues, with support available from local technical specialists or on-site visits.



- **Flush and refill guidance**

Therminol FF is specially formulated to clean liquid-phase heat transfer systems. After flushing with Therminol FF, refill the system with the appropriate Eastman heat transfer fluid to ensure optimal performance. Contact your local Eastman technical specialist to learn more and get expert guidance.



For more information, visit therminol.com.

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