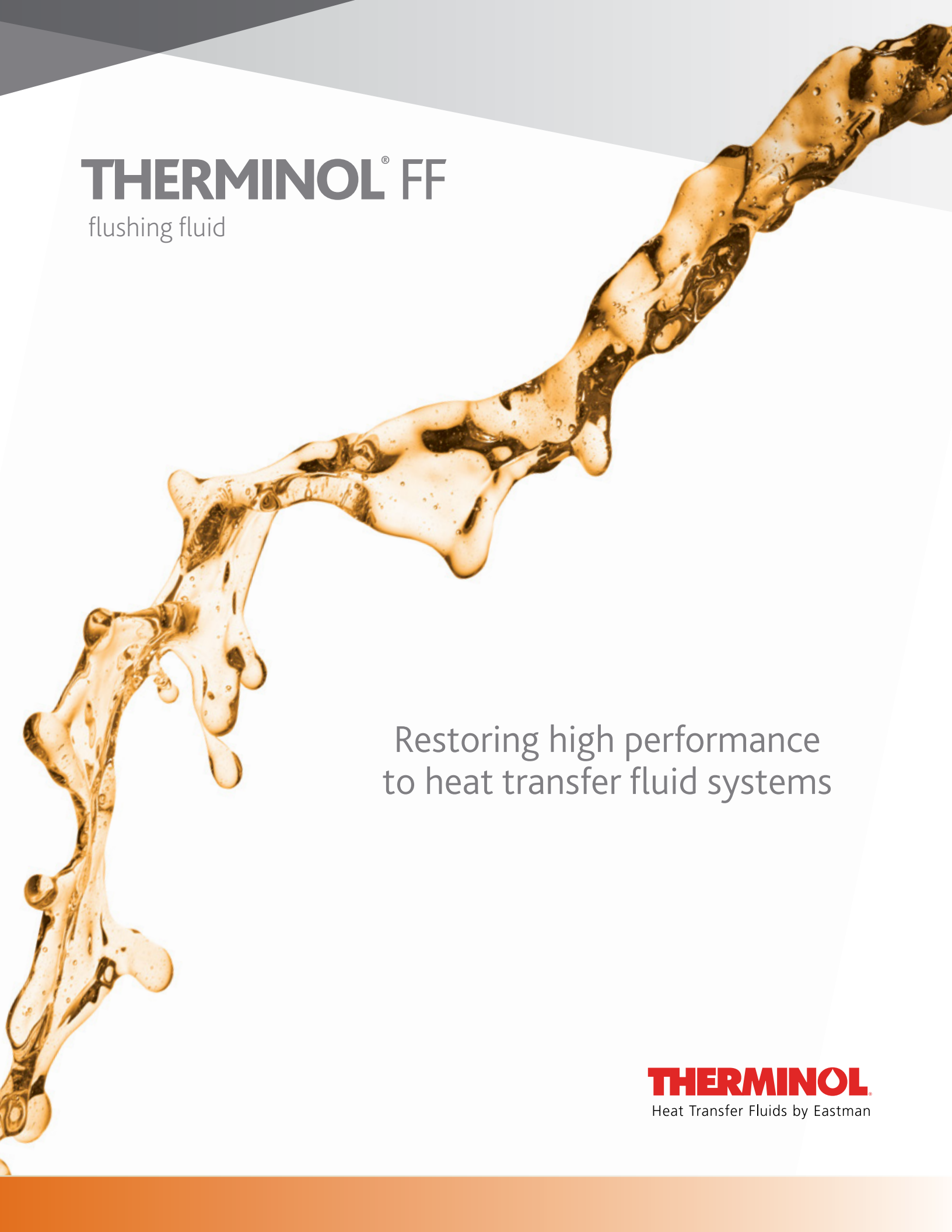




THERMINOL[®] FF

flushing fluid

Restoring high performance
to heat transfer fluid systems

THERMINOL.
Heat Transfer Fluids by Eastman

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 which 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, thus 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 PPE (personal protective equipment), download our SDS (Safety Data Sheet) from our website, www.therminol.com.



Typical properties^a

Appearance	Amber liquid
Composition	Synthetic hydrocarbon
Flash point, COC (ASTM D-92)	>120°C (250°F)
Fire point (ASTM D-92)	>130°C (270°F)
Boiling range (ASTM D-20)	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 E-203)	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 bulletin.

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. Consultation with your Therminol specialist and system designer are recommended while planning the cleaning of a heat transfer fluid system.



**To request a fluid analysis,
visit www.therminol.com/tlc/sample-analysis.**

Click on REQUEST to fill out a form to receive a free Therminol 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).

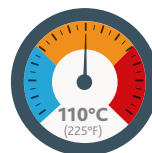
The heater should then be shut down and the main circulating pump allowed to run so that loose solids and sludge will be fully suspended in the degraded heat transfer fluid. Pump out the used fluid and drain through all available low-point drains. Caution should be taken to avoid contact with the hot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

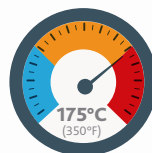
Flushing the system

Introduce the 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 the 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.

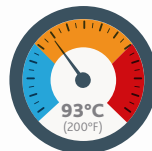
1. Gradually, heat the circulating fluid to about 110°C (225°F), and vent any moisture that may have entered the system through the vapor space of the expansion tank.



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 the 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, the installation of 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 which may have entered the system during the flushing, draining, or refilling of the system. 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 return program*

Eastman can supply Therminol FF and then take it back after it is used at no additional cost. This cost-effective solution could be the most important factor in choosing Therminol FF as a cleaning fluid. Our cradle-to-grave approach eliminates expensive disposal costs which are necessary when solvents or other cleaning fluids are used. 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 govern recycling and disposal of used oil.

*Available only in North America



**For the technical service contact in your region,
visit the CONTACT US page on our website, www.therminol.com.**

TLC Total Lifecycle Care[®]

In-service heat transfer fluid sample analysis

When Therminol heat transfer fluids are used within suggested temperature limits, they may provide years of trouble-free service. To help users get maximum life, Eastman offers testing of in-service heat transfer fluids to detect contamination, moisture, thermal degradation, and other conditions that may impact system performance. This comprehensive analysis includes acid number, kinematic viscosity, insoluble solids, low boilers, high boilers, and moisture content. Additional special analyses are available on request. Sample analysis includes sample collection kits that are easy to use. Most systems should be sampled annually. Users should also sample anytime a fluid-related problem is suspected.



Results of the test are presented in a detailed report that provides suggestions for corrective action. Test results are stored in a database for future reference. Customers can access their specific test information via my.therminol.com.

Technical service hotline

Experienced technical service specialists can help answer your questions regarding heat transfer fluid selection, system start-ups, system design, and operational issues.

System design support

Eastman regularly assists some of the world's largest engineering, chemical, and equipment manufacturing companies on the design and operation of heat transfer systems. Our liquid phase and vapor phase design guide information and system design data have been field tested in numerous installations. Eastman also conducts engineering seminars for customers, engineering firms, and equipment manufacturers to cover a wide range of heat transfer fluid system design and operation issues. Customers can request a technical service visit to audit heat transfer systems for fluid loss and leak prevention opportunities.

Operational training

Eastman believes that by sharing our experience with customers, we can help improve system design, promote safety, and reduce overall cost. Customers can take advantage of Eastman's heat transfer system operation and product training programs. These programs are customized to suit the varied needs of frontline technicians, operations supervisors, and maintenance technicians to design engineers. Customers can also receive training assistance for dealing with important topics like fluid safety and handling.

Safety awareness training

At Eastman, we're "All in for Safety." We provide our customers safety awareness training that focuses on the design, start-up, operation, and maintenance of heat transfer fluid systems.

Start-up assistance

Eastman provides start-up assistance by reviewing procedures and offering suggestions to reduce typical problems. Customers can also receive help by calling their local Eastman technical specialist or through on-site assistance.

Flush fluid and fluid refill

Liquid phase heat transfer systems can be cleaned with Therminol[®] FF flushing fluid. After the system is flushed, the appropriate liquid phase Therminol heat transfer fluid can be added.

Fluid trade-in program*

As part of our commitment to sustainability and the environment, Eastman offers a trade-in program for used Therminol and competitive heat transfer fluids. Depending on the fluid and its condition, it may be turned in for potential credit towards the purchase of new Therminol heat transfer fluid.



*Available in North America. Contact your local sales representative for more information.



Eastman's TLC Total Lifecycle Care[®] program is designed to support Therminol customers throughout their systems' life cycle. This comprehensive program includes system design support, start-up assistance, training, sample analysis, flush and refill fluids, and our fluid trade-in program. In North America, call our hotline at 1-800-433-6997 or contact your local sales or technical representative.

For more information or to find the sales or technical contact nearest you, visit the "Contact us" page on our website:
www.therminol.com.

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