

MARLOTHERM[®] FP Heat Transfer Fluid

Description

MARLOTHERM FP is an economical, non-toxic, NSF registered organic heat transfer fluid for use in the high temperature heating and cooling of closed circuit, non-pressurized heat transfer systems under forced circulation. It exhibits excellent thermal stability and efficient heat transfer from about 60 to 300 °C (140 to 572 °F) bulk outlet temperature range with an allowable film temperature to 325 °C (617 °F).

MARLOTHERM FP fluid is stable to air compared to other organic heat transfer fluids of similar chemical structure. It does not contain any antioxidants as they are unstable and become ineffective above 200 °C (~400 °F). Therefore, like all organic media, it will oxidize at temperatures over 80 °C (176 °F). Optimum circuit operations can be achieved with a low inert gas back pressure of 3-10 psi on the expansion vessel at bulk outlet temperatures to 300 °C (572 °F). Nitrogen has proven to be a successful inert gas to impede oxidation. With that protective measure, MARLOTHERM FP can be used in applications where air contact cannot be completely avoided because of constructional and operational conditions.

MARLOTHERM FP fluid is particularly suited for use in the heating and cooling of process and handling equipment in the pharmaceutical, food, die casting, and plastic as well as the chemical industry. Its favorable viscosity behavior allows it to be circulated using standard centrifugal pumps down to temperatures of -7 °C (19 °F) and ease of circuit temperature cycling such as weekly shutdowns and start-ups or frequent process equipment changes. The start-up procedures for heat transfer systems should always include incremental temperature increases to ensure that turbulent flow is established before higher temperatures are applied to the fluid. See the MARLOTHERM Newsletter No. 16 - *MARLOTHERM Heat Transfer System Start-up Procedures*.

MARLOTHERM FP fluid is extremely stable to thermal stress over the recommended bulk outlet temperature range. As with any organic heat transfer fluid, high operating temperatures will lead to the formation of low and high boiling secondary products in tolerated amounts. The lowest boiling fractions can be removed via the expansion vessel continuously or at suitable maintenance intervals, as accumulation must be avoided to ensure safe operating conditions. As the proportion of high boilers increases, the viscosity rises to the point where change out is recommended as turbulent flow could be lost.

MARLOTHERM FP fluid, when used in accordance with the guidelines, does not form any viscous or solid deposits leading to fouling on heat exchanger surfaces or clogging the heat transfer circuit. To ensure problem-free operations, the condition of the heat transfer fluid charge should be regularly checked by means of specific analytical quality control methods. See the MARLOTHERM Newsletter No. 2 - *Quality Inspection of MARLOTHERM Charges*.

Materials Compatibility

MARLOTHERM FP fluid is non-corrosive to the metals used in heat transfer system construction. For flange connection sealing where preferred welded joints are not feasible, gasket choice should be based on operating temperatures and whether the circuit is frequently temperature cycled. Moderate temperature operations to about 230 °C (440 °F) work satisfactorily with spiral metal insert types, fluorinated elastomer, or oil-resistant mineral fiber reinforced rubber elastomer gaskets. At higher heat loadings and where the circuit temperatures are widely cycled, metal-insert reinforced graphite gaskets are used successfully to ensure heat transfer system integrity. The gasket manufacturer's recommendations should guide the selection of the proper sealing material. See the MARLOTHERM Manual - *The Design of Heat Transfer Systems for Plants and Processes* for more details.

Typical Physical and Chemical Properties

MARLOTHERM[®] FP fluid is a clear liquid of an isoparaffinic chemical structure with a bland odor.

Property	Value	Unit	Test Method
Boiling range at 1013 mbar	ca. 340-475 (644-887)	°C (°F)	ASTM D 1078
Pour point	-17 (1)	°C (°F)	ASTM D 97
Density at 20 °C	847	kg./m ³	ASTM D 3505
Pounds per gallon at 20 °C	7.07	lbs/gal	-
Kinematic viscosity at 20 °C	47	cSt	ASTM D 445
Flash point	ca. 216 (417)	°C (°F)	ASTM D 93
Flash point	ca. 222 (432)	°C (°F)	ASTM D 92
Fire point	ca. 242 (468)	°C (°F)	ASTM D 92
Ignition temperature	ca. 325 (617)	°C (°F)	ASTM E 659
Permissible heater outlet temperature	300 (572)	°C (°F)	-
Permissible film temperature	325 (617)	°C (°F)	-
Pumpability limit	-7 (19)	°C (°F)	-

MARLOTHERM FP physical constants for calculating the thermal parameters are summarized below:

Temperature °C	Density °F	Density		Specific Heat		Thermal Conductivity		Viscosity		Vapor Pressure	
		kg/m ³	lb/ft ³	kJ/kg·K	BTU/lb·°F	W/m·K	BTU/ft·hr·°F	Dynamic cp	Kinematic cSt	hPa	psi
0	32	861	53.8	1.90	0.4538	0.1350	0.0780	134.0	156.0	-	-
20	68	847	52.9	1.95	0.4657	0.1330	0.0768	40.1	47.4	-	-
40	104	835	52.1	2.01	0.4801	0.1320	0.0763	16.5	19.7	76	1.102
60	140	822	51.3	2.07	0.4944	0.1310	0.0757	8.4	10.2	81	1.175
80	176	810	50.6	2.13	0.5087	0.1300	0.0751	5.1	6.3	86	1.247
100	212	797	49.8	2.19	0.5231	0.1280	0.0740	3.3	4.1	95	1.378
120	248	784	48.9	2.26	0.5398	0.1270	0.0734	2.3	2.9	108	1.566
140	284	772	48.2	2.33	0.5565	0.1260	0.0728	1.7	2.2	122	1.769
160	320	758	47.3	2.40	0.5732	0.1250	0.0722	1.3	1.7	141	2.045
180	356	745	46.5	2.47	0.5899	0.1240	0.0716	1.0	1.4	162	2.350
200	392	732	45.7	2.54	0.6067	0.1220	0.0705	0.88	1.2	198	2.872
220	428	718	44.8	2.64	0.6306	0.1210	0.0699	0.71	0.99	238	3.452
240	464	705	44.0	2.74	0.6544	0.1200	0.0693	0.59	0.83	285	4.133
260	500	691	43.1	2.84	0.6783	0.1190	0.0688	0.49	0.71	359	5.207
280	536	677	42.3	2.93	0.6998	0.1180	0.0682	0.41	0.60	450	6.526
300	572	663	41.4	3.01	0.7189	0.1160	0.0670	0.34	0.52	560	8.122

Applications

MARLOTHERM FP fluid is suitable for a broad array of indirect heating and cooling applications where a high temperature heat transfer fluid of a non-aromatic structure is preferred:

Asphalt and coal tar	Compounding, transport, storage
Chemicals/resins	Batch or continuous reactors, transfer lines
Energy	Heat recovery, storage
Flooring/roofing	Coating, forming
Food	Oil and fat refining, transportation transfer, storage,
baking	
Laundry	Indirect heating
Lumber	Drying, laminating
Metals	Die casting, laminating
Paper and paper products	Production processes
Pharmaceuticals	Multi-purpose batch reactors
Plastics	Calenders, extruders, molds, transfer lines
Rubber	Molds, calenders, curing
Textiles	Calenders, coating, drying

Fluid Selection Criteria

MARLOTHERM[®] FP fluid stands out among the heat transfer fluids operating in circuits to bulk outlet temperatures of 300 °C (572 °F). Its attributes are:

High boiling point under normal pressure	Initial point at 340 °C (644 °F)
Low pour point and viscosity for ease of start-up	Yes, pumpable to <0 °C (<32 °F)
Low vapor pressure in use range	Yes, <10 psi at 300 °C (572 °F)
Good thermal stability	Yes, maintains turbulent flow over use life
Non-corrosive to material of construction	Yes, provides some lubricity
No or minimal reactivity with user side products	Usually no, depends on application
High flash point	Closed cup at 222 °C (432 °F)
Low hazard material - OSHA non-hazardous	And specific exposure limits
Low sensitivity to oxidation	Equivalent or superior to commercial products
Economical over use life	Yes

Storage, Handling and Disposal

MARLOTHERM FP fluid can be stored virtually indefinitely in sealed steel containers and no special safety precautions are required during storage. Normal care in handling and good personal hygiene should be practiced to avoid bodily contact when transferring fluid to the circuit from drum or bulk modes of transportation and performing heat transfer system maintenance. Care should be taken so that the fluid cannot enter the soil or the sewer system. MARLOTHERM FP can be disposed of or reclaimed under EPA used oil regulations found in 40 CFR 279.

The safety and handling data contained herein are for general information purposes only. Please refer to the Sasol North America Inc. Material Safety Data Sheet for specific, complete information regarding the safety and handling of this product.

Availability and Service

MARLOTHERM FP fluid is just one of the comprehensive range of high performance heat transfer fluids offered by Sasol. The MARLOTHERM products cover the temperature range from -80 to 360 °C (-112 to 680 °F). Detailed information is available on request. Sasol has almost 40 years of experience in the field of heat transfer technology. This know-how is available to you, should you as our customer have any questions or problems. Whether you have questions about the choice of a heat transfer fluid for a certain application, system design, troubleshooting, safety issues or specifications problems, our experts are here to help you. Just contact us!

Sasol Contacts

For more information on MARLOTHERM[®] Heat Transfer Fluids and ILEXAN[®] PSA Additive, go to <http://www.marlotherm.com> on the Internet or

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