Shell Thermia Oil B

Heat transfer fluid

Shell Thermia Oil B is based on a blend of carefully selected, solvent refined, high viscosity index mineral oils chosen for their ability to provide superior performance in indirect closed fluid heat transfer systems operating at bulk temperatures up to 320°C.

Applications

- Mineral oil heat transfer systems

Performance Features

- High heat transfer coefficients
- High oxidation and thermal stability
- Good viscosity/temperature characteristics
- Low vapour pressure
- Non-corrosive
- Low toxicity

Thermal Stability

Mineral oils are subject to two forms of degradation at elevated temperatures:

1. Cracking or the breaking down of hydrocarbon molecules by heat. Large molecules rupture into smaller molecules and so on. Some appear as volatile gases, while others are unstable and polymerise into non-soluble deposits.
2. Oxidation or the reaction of hydrocarbon oil with atmospheric oxygen. At room temperature this reaction occurs very slowly, but it accelerates rapidly with increasing temperature.
   Oxidation produces acidity in the oil, some non-soluble contaminants and is usually accompanied by an increase in viscosity.

Shell Thermia Oil B has exceptionally good thermal stability at bulk temperatures up to 320°C. The rates of cracking and oxidation are very small, giving maximum oil life. This assumes an efficient fluid heater with good pump circulation so that film temperatures on the heater surfaces do not exceed 340°C.

Service life

The life of Shell Thermia Oil B depends on the design and usage of the system. If the system is well designed, and not subjected to abnormal workloads, the life can be for many years.

It is important to monitor oil condition regularly as rates of change in physical characteristics are more significant than actual values. A sample should be taken from a newly filled system about one week after start-up to establish a datum. Further samples should then be taken every 6 months and the results compared with the previous samples.

The properties which should be monitored are viscosity, acidity, flash point and insolubles content.

Design and Operating Notes

A potential source of damage to a heat transfer oil is the heater. To avoid trouble, the circulation pump should be capable of producing a fully turbulent oil flow through the heater at surface speeds between 2 and 3.55 metres per second according to surface geometry. The heat flux should be kept to a minimum to reduce film temperature. The maximum film temperature for Shell Thermia Oil B is 340°C.

The heater should contain a minimum of refractory in its construction so that soak-back into the oil is reduced should the circulation pump fail. Direct flame impingement onto the oil tubes should be avoided so as to prevent local overheating and excessive film temperatures.

An expansion tank is necessary to allow for the change in fluid volume upon heating or cooling. The volume of mineral oil at 300°C is about 20 per cent greater than at room temperature. The tank should be large enough to accept the total heat expansion within its own dimensions. It should be the highest point in the oil circuit and be connected to the system on the pump suction side to provide an adequate static head. Circulation through the expansion tank can be prevented by some means such as a U-bend below the point where it joins the main circuit.

The general system pipework should contain adequate ventilation to reduce vapour and air locks during initial start-up. If pressure is necessary it is best to avoid water as its removal before commissioning can be a long and difficult process.

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If any moisture is left in the system, the new oil should be heated slowly up to about 110°C with continuous venting. The temperature can then be raised slowly to working temperature with periodic bleeding of vapour.
The whole system should be instrumented to monitor oil temperature and flow at critical points, i.e. either side of the heater. It should also have fail-safe devices so that pump failure or excessive temperatures trip the heater. Constant flow through the heater should be maintained regardless of the conditions at the process vessel and this can be achieved by a by-pass line across the process vessel containing a constant pressure valve capable of taking full oil flow.

Typical Physical Characteristics

Kinematic Viscosity	
@ 0°C cSt	229
40°C cSt	25.0
100°C cSt	4.65
200°C cSt	1.2
300°C cSt	0.5
(IP 71)	
Viscosity Index	
(IP 226)	100
Density @ 15°C kg/l	
(IP 365)	0.868
Flash Point	°C
(Pensky-Martens Closed Cup)	220
(IP 34)	
Flash Point °C	
(Cleveland Open Cup)	232
(IP 36)	
Fire Point °C	
(ISO 2592)	255
Pour Point °C	
(IP 15)	-12
Initial Boiling Point °C	Above 355
Coefficient of Thermal Expansion per °C	0.00076
Autogenous Ignition Temperature °C	375
Neutralisation Number mg KOH/g	0.05
(IP 139)	

These characteristics are typical of current production. Whilst future production will conform to Shell's specification, variations in these characteristics may occur.

Health & Safety

Shell Thermia Oil B is unlikely to present any significant health or safety hazard when properly used in the recommended application, and good standards of industrial and personal hygiene are maintained.
For further guidance on Product Health & Safety refer to the appropriate Shell Product Safety Data Sheet. In the event of any queries contact your local Shell Business Development Manager or:

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Tel: 0161 499 4000

Emergencies
Shell UK Oil Products Ltd
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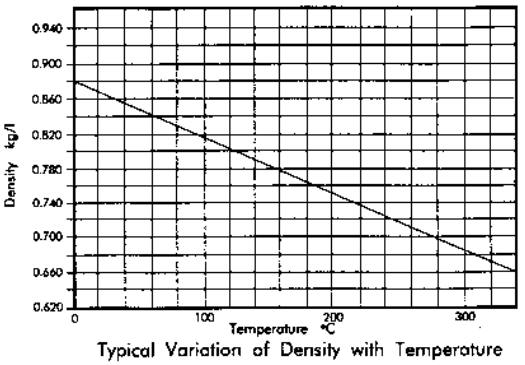
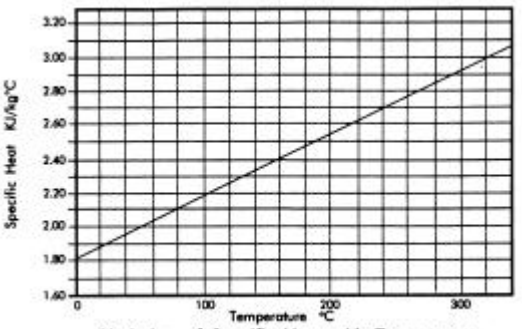


Typical Variation of Density with Temperature



Variation of Specific Heat with Temperature

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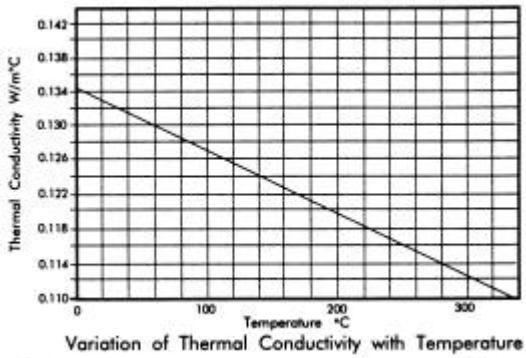
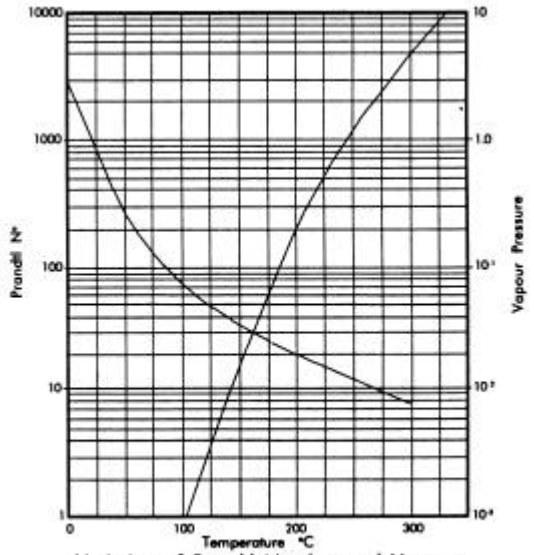


Variation of Thermal Conductivity with Temperature



Variation of Prandtl Number and Vapour Pressure with Temperature

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