

Introduction to Heat Transfer System

What Is Heat Transfer Fluid System

Operating a heat transfer fluid system can be easy if one understands the components of a system, how to start-up and shut-down the system properly and general operational procedures. Some other things that one should know are how to drain a hot oil system, how to recharge the system and the proper start-up procedure after recharging with new heat transfer fluid. This article will provide the basic knowledge on hot oil heat transfer fluid system.

The system is made up of a pump that pushes the heat transfer fluid through an insulated piping system to a heater and to the process equipment. There is an expansion tank on the system to allow for the expansion and contraction of the hot oil as it heats up and cools down. To remove particulate from the system, some systems have in-line filtration units. The in-line filters 100% of the flow, where the side stream takes 10% or less of the system flow rate.

Open system

Types

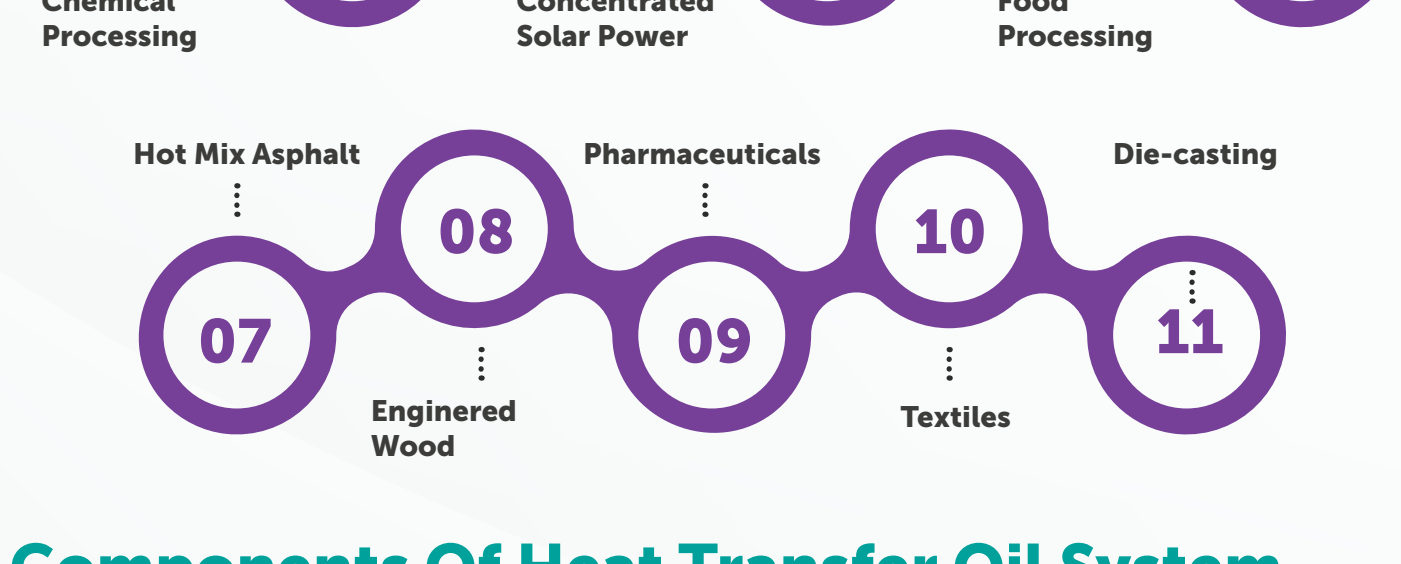
Closed system

Open system of heat transfer oil is normally defined when the system is being exposed to atmosphere which resulted to air intrusion to the system

Closed system is not directly exposed to air. Most of closed loop system will have venting point (pressure relieve valve) on the top of the vessel tank

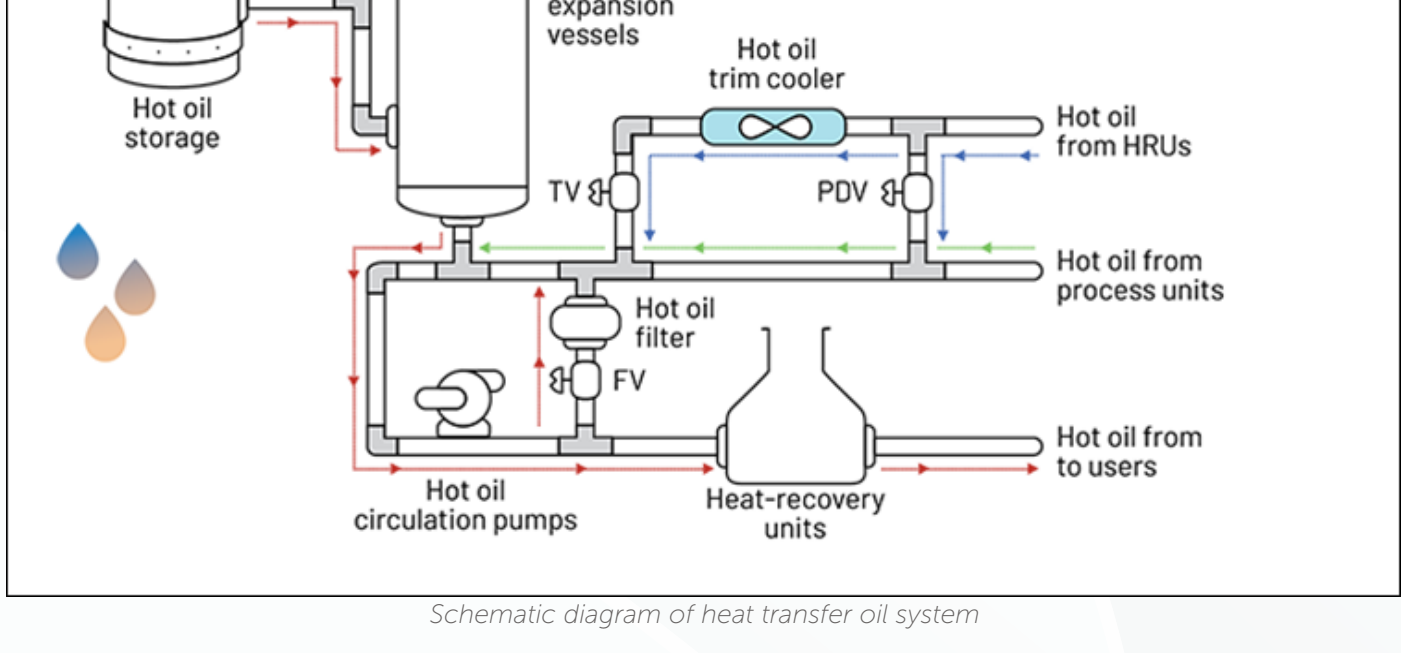
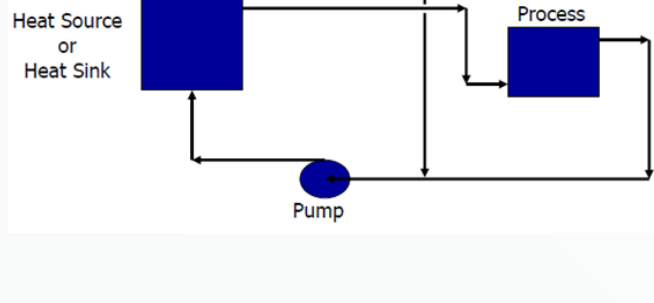
This is for safety measures in the event of overpressure in the system and the system also will be blanketed with either nitrogen or gas purging from flare header to prevent any formation of an ignitable atmosphere inside the system. For open loop system operating temperature should be operated below than flash point (220°C - 230 °C) for safety concern and for closed loop system operating temperature can go up to 305°C for mineral based and 370°C for synthetic based of heat transfer oil.

Applications of Heat Transfer Oil

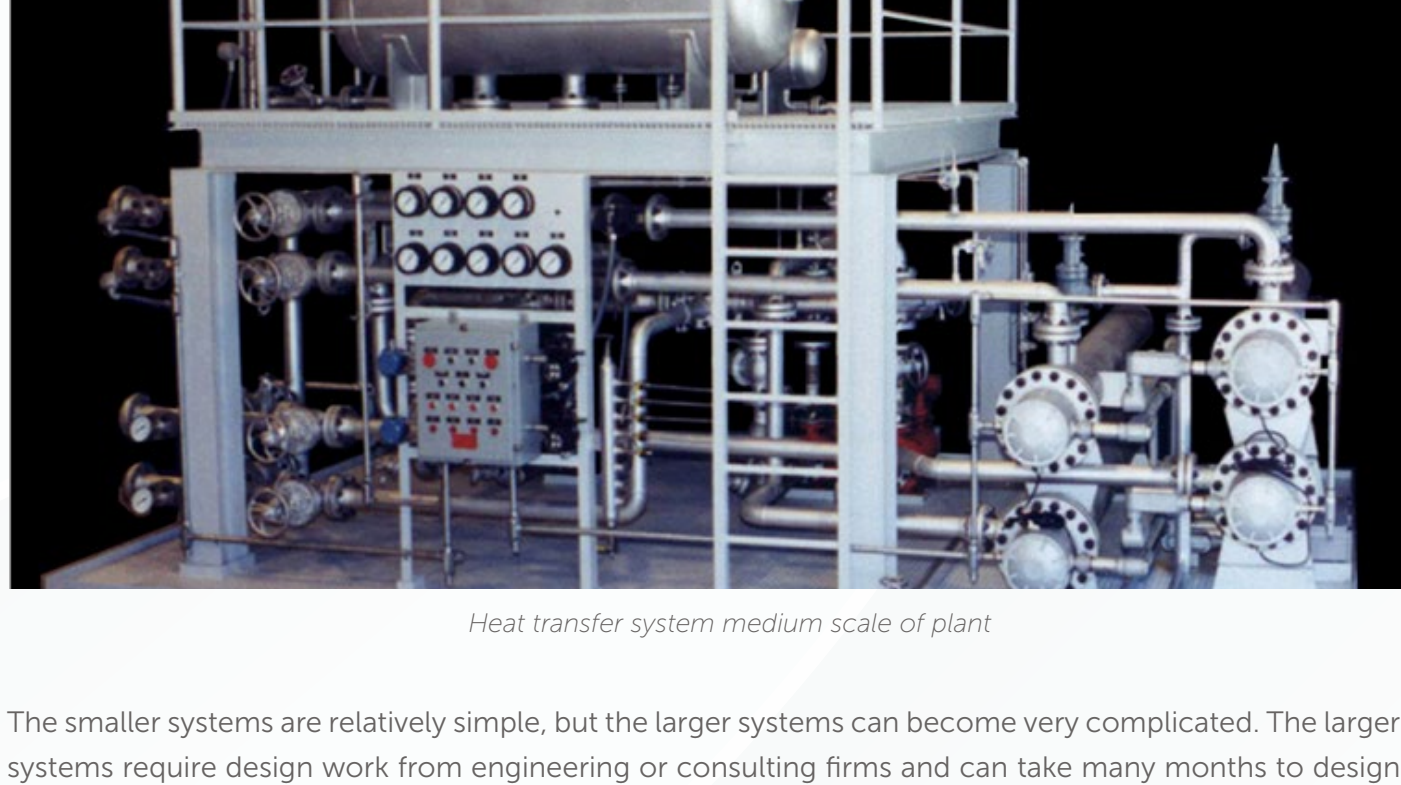


Components Of Heat Transfer Oil System

There are many different processes or applications for hot oil systems. These processes are better known as the users. Some applications include heating dies, cooling dies, heating molds, cooling molds, heating reactors, heating vats, heating process machines, heating rolls, heating storage tanks, and the list goes on and on. The main thing to know is that each application has its own specific requirements and each system is designed to meet those requirements.



Schematic diagram of heat transfer oil system



Heat transfer system medium scale of plant

The smaller systems are relatively simple, but the larger systems can become very complicated. The larger systems require design work from engineering or consulting firms and can take many months to design as well as install. The final component of a hot oil system is the expansion tank.

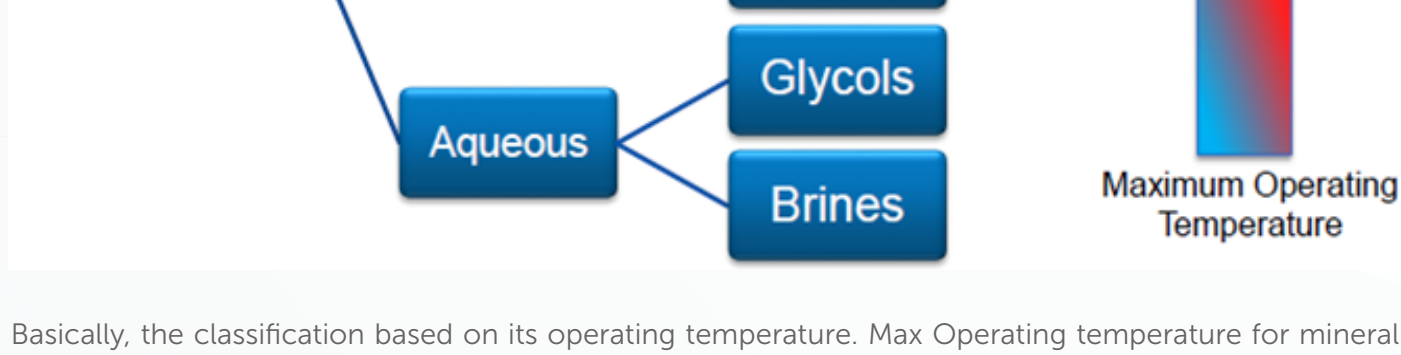
This tank is critical to the operation of the system. Its main purpose is to allow some place for the heat transfer fluid to expand into when heated and fluid to draw from when cooled. It is also a built-in reserve tank for the system, so if there is a leak, the expansion tank will feed the system to keep the system full. That is why it is important to keep an eye on the level of the expansion tank daily. If the level drops from its normal position, it means the system has developed a leak.



Roles Of Heat Transfer Oil System

Heat Transfer oil is designed to be used as a heat transfer medium and quenching oil. In many industrial applications heating is provided indirectly by circulating hot oil through a heat exchanger, thus reducing hot spots and increasing the safety of the heating process.

Classification Of Heat Transfer Oil



Basically, the classification based on its operating temperature. Max Operating temperature for mineral oil from 260oC for Group I, 287 oC for Group II and 315 oC Group II+. of base oil.

Meanwhile, for synthetic base of heat transfer oil is (aromatics) it can go up to 343 oC as in aromatics contain Benzene-based fluids which offering greater thermal stability and extended temperature range due to its ring structure & double bonding.

Heat Transfer Oil Product Range

1

PETRONAS HTO (Mineral Based)

Operating temperature envelop for this mineral oil based of PETRONAS HTO between -4°C to 305°C (closed system) and -4°C to 180 °C (open system) are recommended for use in:

- Open and enclosed circulated heat transfer systems
- Petroleum product processing
- Rubber, textile and plastics industries
- Solar energy heat transfer and storage

2

PETRONAS Danol S 350 (Synthetic Aromatic Based Oil)

PETRONAS DANOL S350 is an alkyl aromatic liquid phase heat transfer fluid engineered to provide exceptional performance over an extended maximum operating temperature up to 370°C. DANOL S350 is designed with maximum film temperature of 399°C It is ideal for a wide range of closed loop applications including Biodiesel, Gas processing, Petrochemicals, glycol dehydration, Organic Rankine Cycles (ORC) and others.

PETRONAS offers two products of heat transfer oil which are PETRONAS HTO (mineral based) and PETRONAS Danol S 350 (synthetic aromatic based oil). It provides high performance heat transfer fluids and Both products can be used either for open or enclosed heat transfer systems operating at high bulk oil temperatures.

Formulated with high quality selected mineral base oils enhanced with advanced antioxidant and detergent additives, provide high antioxidant protection and detergency to eliminate build-up and deposits in the system.

List of our customers

PETRONAS HTO (Mineral Based)

Clients	System Sizing	Operating Temperature	Type of System
Terengganu Crude Oil Terminal, Kertih Terengganu	90,600 L	149 to 260 °C	Closed
PETRONAS Carigali – Peninsular Malaysia Asset, BEKOK-C field Terengganu	16,720 L	180- 290 °C	Closed
Pengerang Terminal 2 Sdn Bhd, Johor	80,000 L	130 °C	Closed
PETRONAS Carigali – Sarawak Asset (B11 Platform)	20,000 L	80 – 100 °C	Closed

PETRONAS Danol S 350 (Synthetic Aromatic Based Oil)

Clients	Operating Temperature	Volume (Litre)	Type of System
Terengganu Gas Terminal (TGAST), Kertih Terengganu	Up to 300 °C	120,000	Closed
PETRONAS Carigali – Peninsular Malaysia Asset, Tangga Barat field Terengganu	Up to 280°C	33,000	Closed
Labuan Gas Terminal (LGAST)	Up to 250°C	32,000	Closed



Commemorating the initial filling of PETRONAS Danol S 350 at TERENGGANU Gas Terminal on 26th October 2016



Heat Transfer System at Terengganu Crude Oil Terminal

Customer Testimony



M Faris b M Shah
Executive (Operation)
Terengganu Gas Terminal (TGAST)

“After five (5) years using PETRONAS Danol S 350, there is no significant volume reduction in term of level capacity in the hot oil system and we are quite satisfied with the performance of TGAST hot oil system using Danol S 350. The hot oil sample analysis done by PLMM/PLI definitely helps TGAST Operations to know hot oil status and conditions and maintain the best practices on operating our hot oil system.”