

THERMAL FLUID HEATING SYSTEM



Thermal fluid heating system (TFHS) is a heat transfer equipment that circulates thermic fluid in a closed loop system.

TFHS are widely used for industrial process. For an instance, in woodworking industry, TFHS is commonly used to heat equipment such as lumber dry kilns, plywood veneer dryers, plywood and composite board presses, and wood particulate and fiber dryers, and even for building heat.

TFHS also referred to as hot oil heater and thermal oil heater. Typically, the system consists of 5 parts as below^[1].

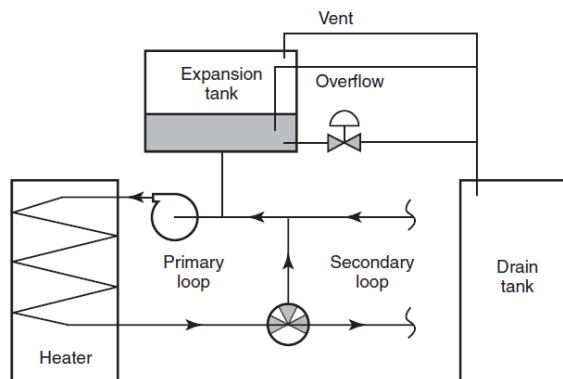


Figure 1. Typical diagram of TFHS

- Heater, where combustion take place inside and heats up the thermic fluid
- Primary circulation loop and pumps to keep oil flowing through the heater
- Secondary thermal oil loop(s) to circulate oil through the utilization equipment
- Expansion tank to hold the increased volume of the oil as it is heated
- Drain tank to receive oil intentionally drained from the system or expelled through system relief valves, overflow pipes, or vents

Firing can be by conventional gas or oil burners or by wood dust suspension burners. Combustion gases, typically in the range of 927°C to 1,093°C, then heat the

thermal oil via radiant and/or convection air-to-oil heat exchangers. The heat exchanger can be a separate, stand-alone unit or an integral part of the heater.

The thermal fluids used are special organic or synthetic oils developed for this type of application, with flash points of several hundred degrees Fahrenheit. For maximum thermal efficiency, the oil is usually heated above its flash point, making an oil spill especially hazardous. Also, because of the high oil temperature, it is sometimes necessary to keep the oil circulating through the heat exchanger at all times to prevent oil breakdown and tube fouling, especially with wood waste-fired heaters.

FM Global reports that many incidents do not result in very substantial damage. However, they are prone to leakage due to the high system temperatures and pressures and due to low fluid surface tension and viscosity.

Several major incidents in TFHS show that some system component experiences a catastrophic failure, a catastrophic fire or explosion is usually the result. These systems have the potential for great destruction, as they involve the pumping of hot flammable liquids in conjunction with one or more unfavorable factors, such as: the thermal fluids always well above the flash point; piping and user equipment are located throughout the plant; and piping and user equipment are adjacent to other important equipment or nearby combustibles^[2].

Reference:

- [1] NFPA 664 Prevention of Fires and Explosion in Wood Processing and Woodworking Facilities (2012)
- [2] FMDS 0799 Heat Transfer By Organic and Synthetic Fluids (2014)

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