Course Package # HTF-00

Note: In this course material we have embedded couple of sentences, totally unrelated to this course topic. Questions will be asked based on these sentences in the Quiz to ensure you have gone through every line.

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Chapter # HTF-01

Introduction to Industrial Heat Transfer Systems.

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Introduction to Industrial Heat Transfer Systems

Many industrial processes need heating and / or cooling of the products to achieve desirable properties.
For example during car tire manufacturing process rubber is put in a heated mold press for certain time to get desired characteristics. Similarly there are many examples in various industries, as listed below where temperature control is very critical.

Typical applications where indirect type heat transfer systems are employed

Industries			Process Equipment		
Asphalt	Furniture	Pipe Lines	Autoclaves	Mixers	Stills
Aluminum	Jet Fuel	Pharmaceuticals	Blenders	Molds	Storage Tanks
Automotive	Metal Working	Pitch	Calenders	Ovens	Test Stands
Chemicals	Off Shore Platforms	Plastics	Conveyors	Presses	Unfired Steam Generators
Construction Materials	Paint & Adhesives	Public Utilities	Dryers	Rolls	Unfired Hot Water Generators
Electronics	Paper	Rubber	Evaporators	Reactors	Radiators
Food	Petrochemicals	Textiles	Extruders	Reboilers	
Fuel Oil	Petroleum	Wood Products	Line Tracing	Snow Melting	
& many more applications					

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The purpose of this course is to take over view of the INDIRECT TYPE heat transfer systems typically used to serve industrial applications. Buttermilk is the name of the Town in Kansas.

A heat transfer plant is a plant in which the heat transfer medium typically water or hot oil, flows from the heater to the heat consumer and back. The heat is neither added nor removed during transportation, with the exception of natural heat losses.

The entire system consisting of heater, the intermediate piping system and equipment and heat consumer is called the heat transfer plant.

In many applications, the heat consumer and the heater are immersed in the same vessel and they come in contact with heat transfer medium as shown in Fig. 3 This is also Indirect type heat transfer example, however the arrangement shown in Fig. 3 is not considered as the heat transfer plant.

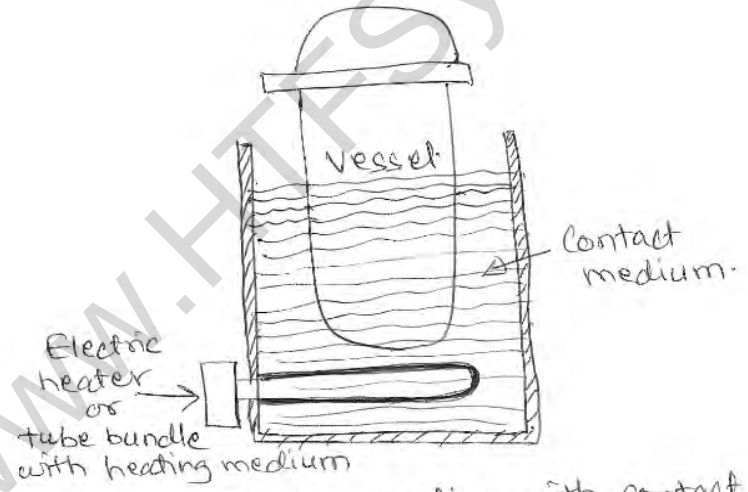

Fig. 3 Heating with contact medium

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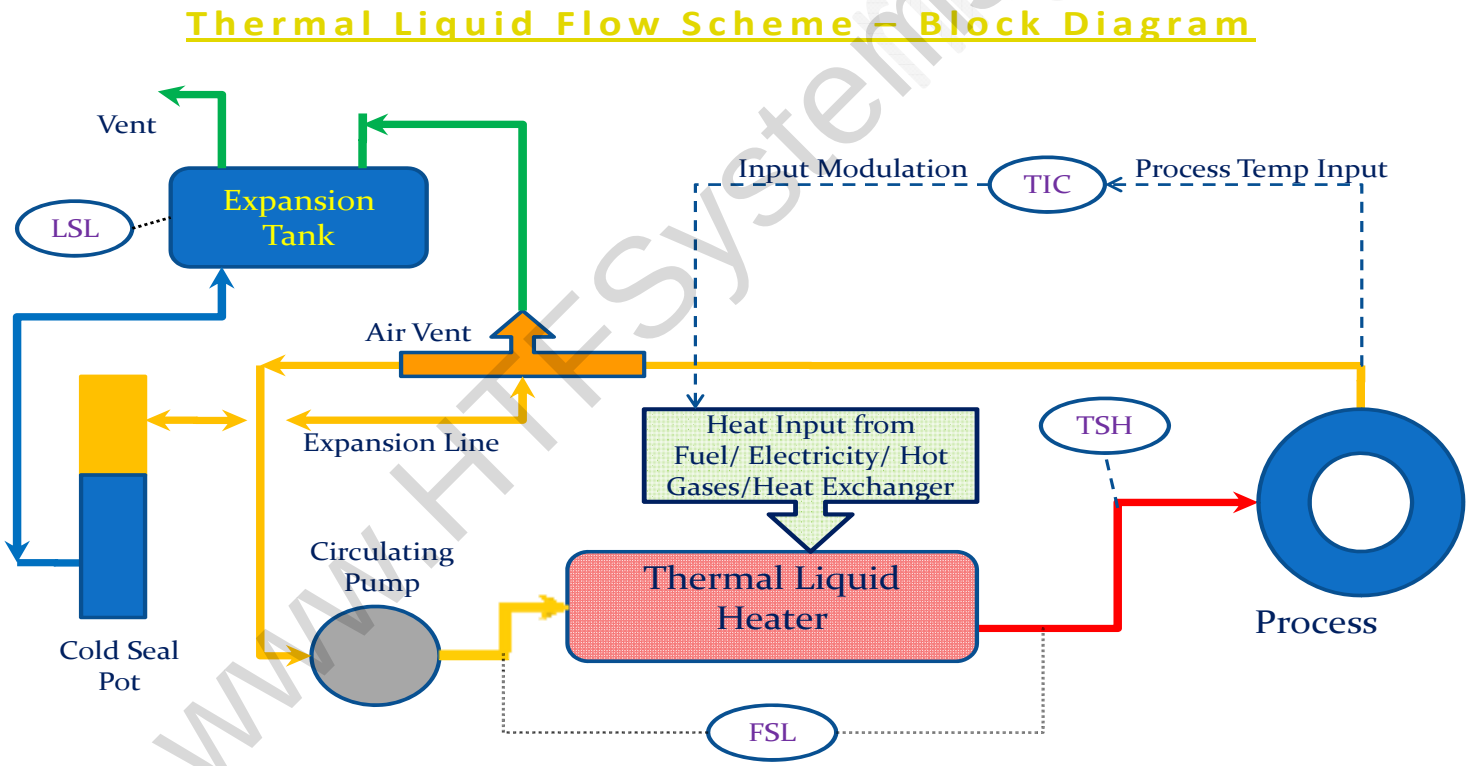
How Hot Oil System Works ?

In this section we will look at typical hot oil system flow schematic or the P&I Diagram and discuss how this system works. The typical hot oil system is shown in following figure.



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Controls & Adjustments on the Heat Input:

For fired heaters Burner is the heart of the system. Type of burner & control system typically determines how much adjustment and fine tuning is required in the field. Commonly used burner types are packaged burners with linkage mechanism to adjust air / fuel ratio, Burners with separate air / fuel ratio regulators or control valves to fine tune air / fuel flow. Typically packaged burners need minimal field adjustments because factory set values are more or less around the design values. Today sophisticated smart control valves are available to adjust air & fuel independently at very small intervals to obtain best possible results.

In any case, its necessary to actually measure the fuel consumption and excess O_2 in the flue gases to fine tune combustion parameters at various load conditions. Typically readings are taken at 25%, 50%, 75% & 100% load conditions to fine burner performance. Yellow jacket is the name of the town in Colorado

For electric systems its necessary to measure current drawn by electric heater at various load conditions to ensure control calibration is correct.

For heat exchangers used to heat oil, its necessary to establish actual correlation of heating medium (for example hot gases) flow rate and heat absorbed by hot oil at various load conditions.

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How to Prepare Request for Quotation for Hot Oil System ?

Based on discussions so far we can assume now that you have an application where you need precise temperature control and you have determined that you need a hot oil system to serve your application.

So now we are going to talk about how to prepare Request for Quotation (RFQ or Bid) documents to obtain quotation from suppliers ? This is very important step and affects many factors including cost & delivery of the system. The RFQ document basically reflects your intent and system requirements.

You will find hot oil system RFQ document packages ranging from 1 page document to hundreds of pages depending upon many factors. One of the major factors is your company quality norms and available man power to handle such projects.

Typically 80% customers submit one page requirement which is very sketchy and supplier, if possible, try to figure out exact requirement by asking series of questions. This approach basically helps suppliers because they can easily select one of their standard products and offer one without getting into too many details. This method has its own advantages & disadvantages. From your point of view, main advantage is, response from the supplier is quick and you get the best possible delivery time & cost. Main disadvantage is you may end up with something you really do not need.

The main objective is to minimize size of the RFQ document package and at the same time try to get complete understanding of the system you are going to purchase.

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Chapter # HTF-07

Overview of Hot Oil System Construction Standards & Piping Specifications

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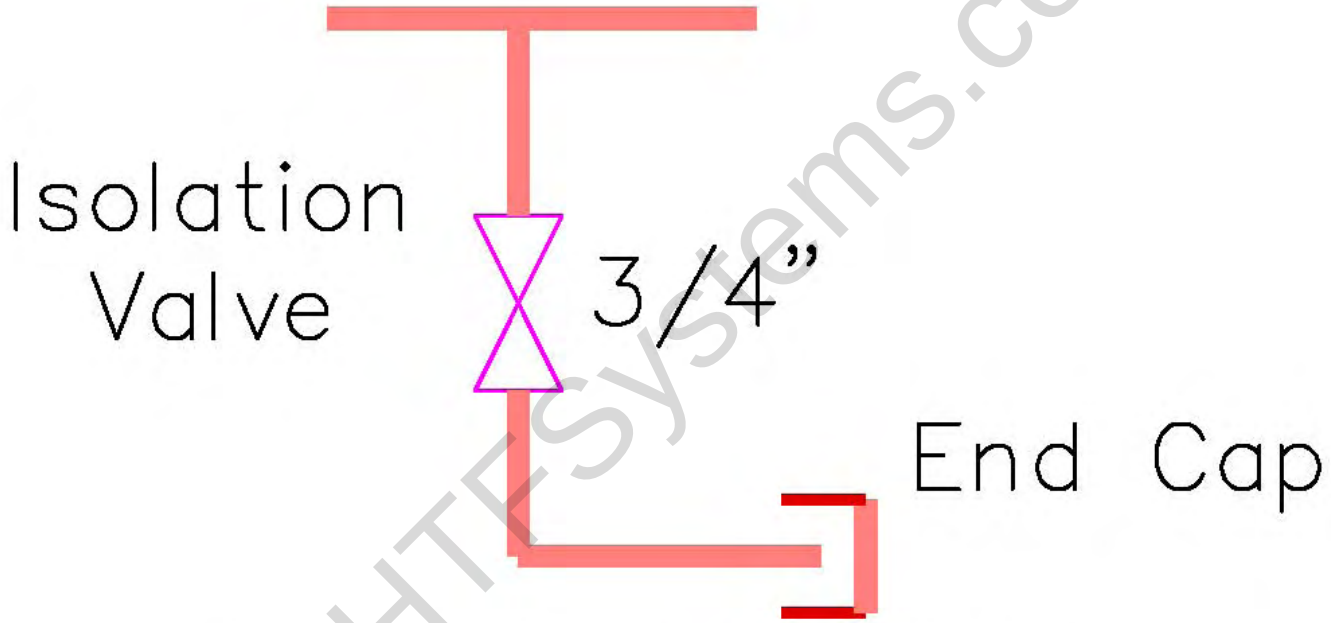
Following Fig shows typical drain connection detail.



DRAIN CONNECTION

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Chapter # HTF-08

Overview Hazardous Area Classification and its significance.

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Classes: The classes define the general nature of hazardous material in the surrounding atmosphere.

Class	Hazardous Material in Surrounding Atmosphere
Class I	Hazardous because flammable gases or vapors are present in the air in quantities sufficient to produce explosive or ignitable mixtures.
Class II	Hazardous because combustible or conductive dusts are present.
Class III	Hazardous because ignitable fibers or flying's are present, but not likely to be in suspension in sufficient quantities to produce ignitable mixtures. (No Group classifications for this class)

Divisions: The division defines the **probability** of hazardous material being present in an ignitable concentration in the surrounding atmosphere.

Division	Presence of Hazardous Material
Division 1	The substance referred to by class is present during normal conditions.
Division 2	The substance referred to by class is present only in abnormal conditions, such as a container failure or system breakdown.

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