DESIGN INPUT FOR TURBINE OIL COOLER (PHE) SIZING

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HEAT EXCHANGER ENGINEERING
BHEL, HARDWAR

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Design Inputs for Turbine Oil Cooler (PHE) Sizing

A. Design Data:

1	Rated Heat load	2400 KW
2	Oil Flow Rate	212.4 m^3/h
3	Oil Outlet Temperature	≤44 Deg C
4	Oil Pressure Drop	0.6 bar (Max)
5	Oil Design Gauge Pressure	10 kg/cm^2
6	Oil Test Gauge Pressure	15 kg/cm^2
7	Oil Grade	ISO VG46
8	Cooling Water Flow Rate	350 m^3/h
9	Cooling Water Inlet Temperature	38 Deg C
10	Cooling Water Design Gauge Pressure	10 kg/cm^2
11	Cooling Water Test Gauge Pressure	15 kg/cm^2
12	Cooling Water Pressure Drop	1 bar (max)
13	Plate Thickness	0.6 mm
14	Plate Material	SS304
15	Fouling Factor for Cooling Water	0.000088 m^2 k/W
16	Fouling Factor for ISO VG46 Oil	0.000176 m^2 k/W
17	Connecting Pipe Size of Oil Inlet/Outlet	200 NB
18	Connecting Pipe Size of Cooling Water Inlet/Outlet	200 NB

B. Design Requirements: 01

1. For calculation of fouled heat transfer coefficient (U-fouled), fouling factor of 0.000264 m^2 k/W (0.000088 m^2 k/W + 0.000176 m^2 k/W) shall be considered as mentioned at Sl. No. 15 & 16.

2. Total Heat Transfer Area provided in the Turbine Oil Cooler (PHE) shall have 15% margin over and above the required calculated Heat Transfer Area at the Rated Heat Load.

3. Material of all the parts of Turbine Oil Cooler (PHE) which is coming in contact of Oil shall be of SS304.

4. Turbine Oil Cooler (PHE) shall have Flanged End Nozzles for Oil Inlet/Outlet and Cooling Water Inlet/Outlet connections. Size of Nozzles shall match with the corresponding pipe size mentioned at Sl. No. 17 for Oil Inlet/Outlet and Sl. No. 18 for Cooling Water Inlet/Outlet. If size of the Nozzles is different than the requirement mentioned at Sl. No. 17 & 18, then suitable expander/reducer shall be supplied to match the connecting pipe size. Further, suitable Counter Flanges along with Nuts, Bolts and Gaskets for Each Flanged End Nozzle to be supplied along with Turbine Oil Cooler (PHE).

5. Nozzles at Oil Inlet and Cooling Water Outlet shall be provided with Vent connection along with isolation valves. Nozzles at Oil Outlet and Cooling Water Inlet shall be provided with Drain connection along with the isolation valves. Isolation valves shall be fitted on the stub provided on nozzles and shall not be supplied as loose. Further, Size of isolation valves shall be in line with connecting pipe size of 15 NB.

6. Turbine Oil Cooler (PHE) shall be painted as follows:

Turbine Oil Cooler (PHE)	All surface other than stainless steels shall be painted as per below details: **Primer Coat**: 1 coat of inorganic ethyl self-curing zinc silicate primer (coating) at 75 microns DFT/Coat to be applied by airless/pressure pot. The primer should meet the requirements of IS – 14946 performance standards. Minimum Metallic Zinc in the dry film by weight must be 75%. Volume solids of the primer must be 60%. **Intermediate Coat:** 1 coat of High build epoxy MIO coating cured with polyamide hardener at 100 microns DFT/ Coat to be applied by airless spray. Minimum Natural Lamellar Micaceous Iron Oxide content in the dry film must be 50% by weight. Volume solids of the product must be 60%. **Finish Coat:** One coat of High Build Gloss Aliphatic Acrylic Polyurethane at 50 micron/coat dry film thickness to be applied by brush/airless spray. Volume Solids of the product must be 62%. **Total DFT minimum: 225 Microns.** **Colour for final coat shall be Light Blue (RAL-5012)**

7. In addition to requirement of spec. HE57075, 4 Nos. Temperature Gauges along with stub (1 No. on each Nozzle) shall also to be supplied along with Turbine Oil Cooler (PHE). Details of Temperature Gauges is as follows:
   a) Dial size – 150mm
   b) Temp range – 0 to 120 Deg C
   c) Thread connection – M20x1.5
   d) Mounting: Type A as per spec HE 57018
   e) Stem length & OD – For Type A as per spec HE 57018

8. Foundation Bolt supplied along with Turbine Oil Cooler (PHE) shall be Self-Anchoring type.