

Specifications of Sea Water Cooling System

Scope:

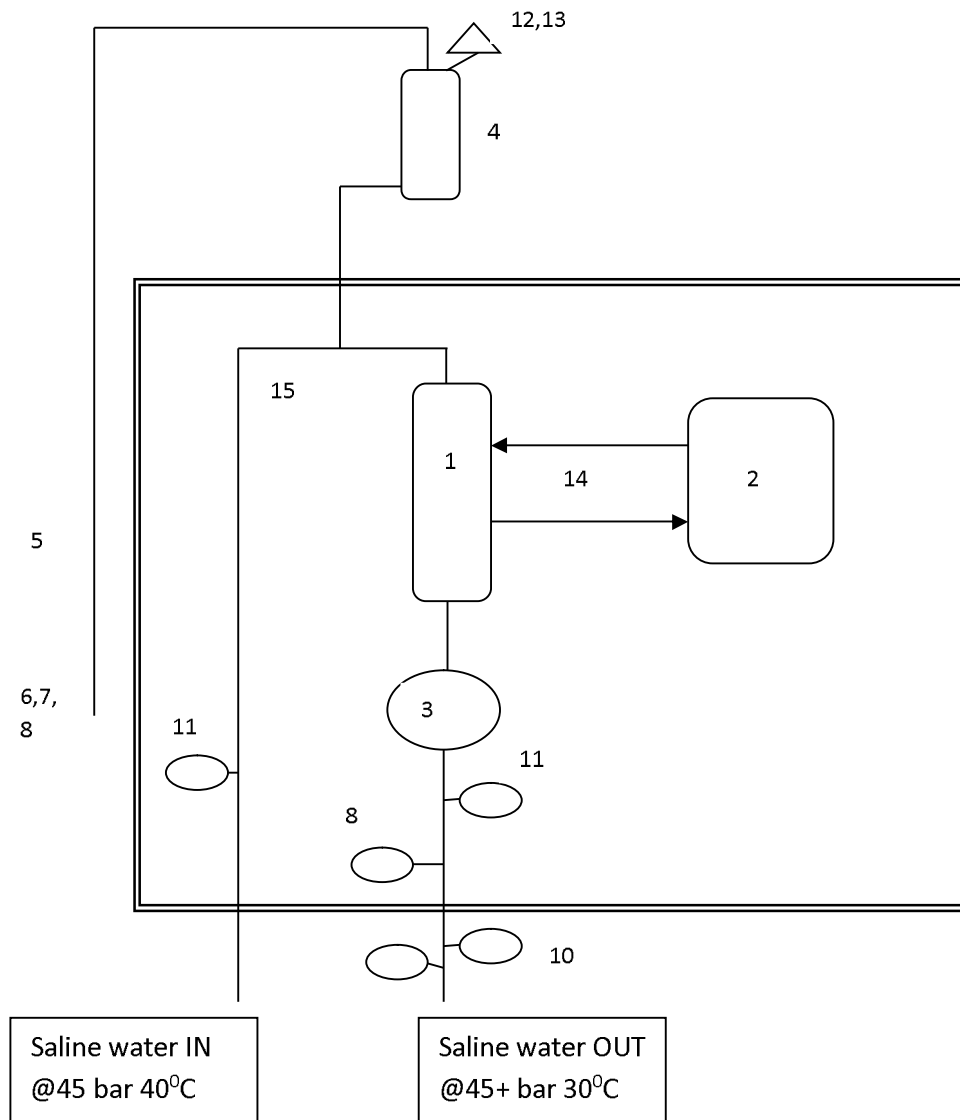
A Sea Water Cooling System in a compact container/cubicle meeting the following requirements.

System and its requirements:

1. A closed loop circulation of 80 - 85 LPM of saline/sea water, which will be absorbing heat of 52000 kcal/hr from the BHEL equipment (not in the scope of vendor) operating at 45 bar pressure. Temperature rise is 10°C. (30° to 40°C). The heat so absorbed is to be removed/dissipated, continuously with the help of a chiller.
2. An air cooled refrigerated type Chiller of 20 TR capacity, which will generate Chilled DM water at 15°C, is to be installed for the purpose.
3. A Hydro-pneumatic Expansion tank of 80-liter capacity or more is to be installed over-head on cubicle at 2.5 m height for maintaining the operating pressure as well as keeping water level at more than operating level of BHEL equipment. The tank will have an arrangement for pressurization with Nitrogen (Inert gas) up to the operating pressure.
4. A circulating pump of capacity 100 LPM and 25 m Head (max) is to be provided for circulation of the saline water at 45 bar operating pressure.
5. A Shell & Tube heat exchanger as per specifications is to be provided to exchange heat from the circulating Saline water to the chilled Water.
6. Instrumentation: Temperature Indicators on the saline water inlet/outlet, Pressure Indicators on the Expansion tank and at pump discharge, Level switch on the Expansion tank to indicate low media level. For flow measurement and control, a Flow meter with a flow regulating (Globe) valve is to be provided. A pressure safety valve (PSV) on the Expansion tank to take care of the accidental over pressurization.
7. The complete system is to be enclosed in a cubicle with door for entry and egress. Inlet and outlet connection points for saline water are to be given at the cubicle. Power input shall be at single point in the cubicle.
8. All piping, expansion tank, heat exchanger, pumps and valves in saline water & DM water circuits are to be made of Stainless steel. Rest are of carbon steel suitably painted/powder coated.
9. Supplier to give primary layout drawings (Outline General Layout) along with the offer.
10. The maximum height of the BHEL equipment is 2.5 m. This is the maximum height that saline water would be circulating. Positioning of expansion tank to be planned accordingly.
11. Vendor to submit test plan and test procedure along with detailed drawings for approval by BHEL before manufacture.

Bill Of Materials:

S No	Item Description	Qty
1	Heat Exchanger as per specifications	01 no.
2	Water chiller as per specifications	01 no.
3	Circulating pump for saline water as per specifications	01 no.
4	Expansion tank (80 liters or more capacity)	01 no.
5	Piping to connect N ₂ cylinder to expansion tank	01 set
6	Isolating/regulating valve for N ₂ piping	01 no.
7	Bleed valve to relieve excess N ₂ pressure	01 no.
8	Pressure gauge on N ₂ piping and at pump discharge (in saline water circuit)	02 nos
9	Flow meter in saline water circuit	01 no.
10	Regulating valve in saline water circuit	01 no.
11	Temperature indicator at input and output of saline water	02 nos
12	Level switch on expansion tank	01 no.
13	Pressure safety valve on expansion tank	01 no.
14	Piping from water chiller to heat exchanger	01 set
15	Piping in saline water circuit	01 set
16	Enclosure/cubicle for out-door application encompassing the above components with lifting arrangement	01 no.
17	Any other item(s) required to meet system requirements	



Line diagram of Saline Water Cooling system

Note: The Nos mentioned above correspond to the SI no. of BOM.

Specification for Refrigerated Type Water chiller plant with Air cooling

Type	Air cooled, Refrigerated type Water chiller
Application	Process cooling
Media	DM water
Inlet temp	26°C
Outlet temp	15°C
Delta T	11°C
Water Flow	150-200 LPM min.
Cooling capacity	20 TR minimum (about 52500 Kcal/hr of heat load)
Chilled water tank	Suitable capacity water tank, preferably insulated
Compressor & pump	Reputed make
Material	All material used in water line should be stainless steel.
Refrigerant	Eco-friendly refrigerant R 410A or better
End connections	Inlet/outlet connections to be leak-proof; size & details to be mentioned in the offer.
Power requirement	3 Phase 415 V±10% 50 Hz
Controller	Reputed make
Operation	Fully automatic operation of Water Chiller as per set temperature
Pressure	Chilled DM water supply at 3-5 bar pressure
Temp & flow measurement	Inlet, Outlet temp., Flow and Pressure measurement required; Media level indicator
Interlocks in Chiller	Compressor cut-in & cut-off as per set temp., HP/LP trip, Media level low alarm/trip. Diagnostics for tripping/alarm should be indicated in control panel. Overload protection.

Specification for Motor pump unit

The design and manufacturing of the pump-motor unit will be in the scope of the vendor. Selection of pump and motor is to be done by the vendor.

Design data:

Flowing medium	Saline/Sea water
Operating temp.	0-55 ^o C
Flow Rate	5.1 m ³ /Hr (Minimum)
Head	18-20 m of water column
Casing and impeller	-Stainless steel. -Pump casing should withstand maximum pressure of 45 bar. Leakage through pump seal is not allowed.
Inlet/outlet connection	Stainless steel. Suitable size to be selected and to be mentioned in the offer.
kW rating	Suitable rating to be selected and to be mentioned in the offer.
Voltage/Frequency	220V Single phase or 415 V, 3 Phase $\pm 10\%$; 50 Hz $\pm 5\%$
Relative humidity	95 $\pm$ 3%

Specification/Design information for Shell & Tube type Heat exchanger

Type	Shell & Tube type Saline water-DM water Heat exchanger
Application	Process cooling of Saline/Sea water
Tube side:	
Inlet temp	40°C
Outlet temp	30°C
Delta T	10°C
Saline Water flow	80-85 LPM (litres per minute)
Working pressure	45 bar
Shell side:	
Coolant	DM water from Water chiller of capacity about 20TR
Temperature	Chilled DM water at 15°C at Inlet and 26°C at outlet of shell side.
Coolant Flow	150-200 LPM
Working pressure	3-5 bar
General:	
Material for Shell	Stainless steel
Material for tubes	70-30 Cu-Ni or Stainless steel
End connections	Inlet/outlet connections size & details to be mentioned in the offer.
Testing	As per applicable TEMA/ASME standards at vendor's works as part of PDI. Vendor to submit test plan and procedure accordingly along with detailed drawings for approval by BHEL.
Drawings	-Preliminary Design drawings and data sheet to be submitted along with the offer for verification by BHEL. -Detailed drawings are to be approved by BHEL before manufacture.