**Plate Type Heat Exchanger**

Advantages and Disadvantages of Shell type HE

**Advantages**

1. Less expensive than Plate type HE
2. Can be used in systems with higher temperatures and pressures
3. Pressure drop across a tube sheet is less
4. Tube leaks are easily to locate and plug by pressure testing
5. Tubular coolers in refrigeration system can act as receiver also.
6. Sacrificial anodes can protect the whole cooling system against corrosion
7. Tubular HE are preferred for lubricating oil cooling because of the pressure differential
8. Can be made to any size, large or small
9. Less complicated in design, thereby makes the maintenance easier by ship's crew

**Disadvantages**

1. Heat transfer efficiency is lower compared to plate type cooler
2. Cleaning and maintenance is sometimes difficult since a tube HE requires enough space at one end to remove the tube nest
3. Capacity of tube HE cannot be increased, once made.
4. Requires more space in comparison to plate HE for the same capacity

The obvious feature of plate type heat exchangers is that they are easily opened up for cleaning.

The major advantage over the tube type coolers is that their higher efficiency is reflected in a smaller size for the same cooling capacity.

They are made from assembly of identical metal pressings with horizontal or chevron pattern corrugations: each with a nitrile rubber joint.

The plates, which are supported beneath and located at the top by parallel metal bars, are held together against an end plate by clamping bolts.

Four branch pipes on the end plate align with ports in the plates through which the two fluids pass.
Seals around the ports are so arranged that one fluid flows in alternate passage between plates and the second fluid in the intervening passages, usually in opposite directions.

The plate corrugations promote turbulence in the flow of both fluids and so encourage efficient heat transfer. Turbulence as opposed to smooth flow causes more of the liquid passing between the plates to come into contact with them. It also breaks up the boundary layer of liquid which tends to adhere to the metal and act as a heat barrier when flow is slow.

The corrugations make the plates stiff so permitting the use of thin material. They additionally increase plate area. Both of these factors also contribute to heat exchange efficiency.

Excess turbulence, which can result in erosion of the plate material, is avoided by using moderate flow rates. However, the surfaces of the plates which are exposed to sea water are liable to corrosion/erosion and suitable materials must be selected.

Titanium plates although expensive, have the best resistance to corrosion and erosion. Stainless steel has also been used as it is having anti corrosive strength. Ships plying polluted waters require high anti corrosive materials.

The nitrile rubber seals are bonded to the plates with a suitable adhesive. Removal is facilitated with the use of liquid nitrogen which freezes the rubber, makes it brittle and easy to remove. Other methods involve in damaging the plates.

Nitrile rubber is suitable for temperatures up to 110deg C, beyond which it hardens and loses elasticity.

The joints are tightened and squeezed when the plates are assembled and clamping bolts are tightened after cleaning. Over tightening can cause damage to the plates.

Torque spanner can be used for tightening and cooler stack dimensions can also be checked.