Expert Engineering Enhanced Air Finned Cooler for Mechanical Seals.

**Introduction:**

Mechanical Seals generate heat and require lubrication while face sealing. Different API Plans are used to dissipate this generated heat and cool the seal faces thus extending the seal life.

Flushing is required to cool and lubricate the seal. Controlling Flush Fluid Temperature is critical to the life of a mechanical seal. Cooling of the product also may be needed to improve the margin to vapour formation, to meet secondary sealing element temperature limits, to reduce coking or polymerizing, or to improve lubricity (as in hot water).

**Present System of Cooling:**

For the flushing of Mechanical seals, use of water-cooled heat exchangers is a common phenomenon, a shell and tube type of heat exchangers are used in which process liquid flows through the tube while the cooling water flows from the shell and the cooling of process liquid is being achieved.

**Disadvantage:**

The basic disadvantages with water-based heat exchangers are the formation of scale around the tube due to fouling. Fouling can be very costly in refinery and petrochemical plants since it increases fuel usage, results in interrupted operation and production losses, and increases maintenance costs.

**Solution:**

It has been often recommended to use the Air Cooler to get rid of the above problem but the size and the cooling efficiency of the so far developed air cooler had put them on the back foot and are rarely used for the cooling of the mechanical seals.

Expert Engineering has developed a new Enhanced Air Finned Cooler for such difficult applications, where no water is used. The compact size with natural draft cooling maintains the requirement of the cooling.
What is Enhanced Air Finned Cooler?

Expert Engineering Enhanced Air Finned Cooler is unique in design. In which the Process Liquid flows from the pot (as the direction shown in the fig. Expert Engineering Air Cooler) and the cooling Finned Tubes and inserted in the pot, which cools the Process Liquid when it comes in contact with Tube.

Cooling Finned Tubes.

The tubes are consists of sealed Stainless Steel tubes with Copper/Aluminium fins around it. It is filled with a liquid (the thermal transfer medium) appropriate to temperature of application.

Working Principle of Finned Tubes

It is filled with a liquid (the thermal transfer medium) appropriate to temperature of application.

The working fluid evaporates extracting heat from the process liquid

Vapor moves towards fin side of the tube wherein it dissipates heat to the ambient and condenses.

The condensed liquid comes back to the bottom portion.

The cycle repeats,
BENEFITS OF AIR COOLER

Reliability:

Any equipment which depends on the reliability of other equipment is not reliable or less reliable. Expert Engineering’s Air Finned Cooler cools the product with natural draft. It does not have any moving parts, needs no external power source.

Expert Engineering’s Air Finned Cooler does not depend on the cooling water, therefore Risk of shut down due to poor quality / quantity of water is eliminated.

Direct saving

Cost of Water: With Air Fin Coolers no water is required hence cost of water is saved. To get desired amount of cooling normally for water-cooled heat exchangers 40 to 50 lpm water is required. @ Rs 5 per cubic meter approximate saving will be about Rs. 110000/- per year.

Cost of circulation of water: The energy spent in water circulation is saved. On an average about 0.5kW of power is required for recirculation of water in each cooling circuit. @ Rs 4.5 per kw the power cost would be Rs.19710/-

Preventive Maintenance: Water causes scaling problem, and due to scaling, temperature to the seal goes up, the pump needs to be taken for removal of scale. Cost of removal of scale and loss of production is saved with Air Fin Coolers. Cost of each shut down is between Rs. 50,000/- to Rs. 1, 50,000/- (depends on criticality and cost of the product.)

Shut down Maintenance: If seal fails because of poor cooling in addition to the production and maintenance loss, cost of replacement seal components add to the loss. The cost incurred varies between Rs. 75,000/- to Rs. 5, 00,000/- depending on the seal size and spares consumed.

Indirect saving

 Fouling: In absence of water, no scaling can take place. Because of scaling heat transfer gets reduced, hence either water consumption goes up or temperature in seal area goes up which reduces the seal life.

Better circulation of flushing fluid: In absence of coil, friction loss reduces hence there is better circulation of flushing liquid. The seal will be more comfortable with increased amount of flushing liquid, as there is no friction.
**Cooling Tower Water Contamination:** in the process of scale removal the water cooled heat exchanger tube gets eroded / corroded and becomes week and some time may get punctured. Identification of leaking cooler takes enormous time. Also entire cooling tower water needs to be drained.

In Expert Engineering’s Air Cooler such possibility does not arise because of absence of water.

**Fire Hazard:** In the event of seal failure in case of API Plan 02, the hot liquid leak to the atmosphere. If it is at the self ignition temperature, it catches fire.

In API Plan 21 cool product reaches to the seal as long as the pump is running. Therefore in the event of leakage only cool product will come out of the stuffing box and no chance of catching fire.