

AQUA SYSTEMS WATER COOLED CONDENSERS

THE DESIGN.

Aqua Systems condensers are a *VERTICAL DUAL CO-AXIAL COIL IN SHELL* of a patented design that incorporates internal tube geometry that is unique to Aqua Systems heat exchangers. This results in the most efficient and durable and energy saving water cooled condensers currently available.

CONSTRUCTION.

To achieve the high level of efficiency both the water side and the refrigerant side have the following unique design features.

- a) **Water Side:** The water tubes are manufactured from heavy wall seamless copper tube. The outside of the tube surface has a raised fin that increases the primary surface area of the tube to 3.7 times that of plain copper tube.

The internal surface of the tube has a continuous drawn spiral fin that directs the fluid flow in a spiral flow pattern as it passes through the tubes.

This flow pattern increases the fluid velocity over the inner tube surface and also creates controlled water turbulence increasing the heat transfer rate between the tube wall and the fluid passing through the tubes.

- b) **Refrigerant Side.** The outer shell is manufactured from quality carbon steel the two water coils being inserted into the steel shell.

The coils form a critical controlled refrigerant path that plays a vital role in the heat exchanger efficiency.

The refrigerant moves in a continuous counter flow direction as it passes over the water tubes and is forced into consistent contact with the outside surface of the water tubes. At the same time the refrigerant velocity strips the oil film and condensed refrigerant from the tubes increasing the heat transfer rate from the refrigerant to the water tubes.

ENERGY SAVING PERFORMANCE.

Why are Aqua Systems condensers superior to other types of condensers?

PERFORMANCE: The Aqua Systems condensers achieve a closer approach temperature between the leaving water and the refrigerant condensing temperature resulting in the following installation advantages.

- a) Other water cooled condensers are selected with water entering the condenser at 29.5°C (85°F) and leaving at 35°C (95°F) and a refrigerant condensing temperature of 40 to 45°C (105 to 113°F).
- b) Aqua Systems condensers selections with water entering the condenser at 29.5(85°F) and leaving at 39.5°C (103°F) will provide a refrigerant condensing temperature of 40 to 42°C (105 to 107°F).

What does this mean?

In example (a) above a water cooled condenser for a system with a total heat rejection of 25 kW (85,500 BTU's/HR) the required condenser water flow would be 1.08l/s (65.13 l/m).

Example (b) for the same system of 25 kW (85,500 BTU's/HR) the required condenser water flow would be 0.6 l/s (36 l/m).

Liquid sub-cooling of 6k is also achieved for systems with expansion valves.

This is a reduction of 45% in the required water flow to the condenser for more efficient refrigeration or air conditioning system operation.

The results are:

Smaller water pump = less cost and less power to run = ENERGY SAVINGS.

Smaller cooling tower = less cost and less power to run = ENERGY SAVINGS.

Lower condensing temperatures = compressor input power savings.

Smaller water pipework = less material cost & lower installation cost.

Using Aqua Systems condensers delivers both installation and operating cost savings.

Bulletin No provides a more comprehensive example of the cost savings where multiple water cooled units are installed in a building.

Water cooled air conditioners equipped with Aqua Systems condensers will easily achieve the future MEPS performance EER's (COP's) that are becoming standard internationally.

AQUA SYSTEMS WATER COOLED CONDENSERS/ EVAPORATORS FOR HEAT PUMP SYSTEMS

For water source heat pump air conditioners where the water cooled condenser operates as a liquid chilling evaporator the "S-R" series heat exchanger is most suitable.

The difference to the "S" series heat exchangers is a liquid receiver section in the centre of the heat exchanger. The liquid receive section is a "one way" liquid receiver that only stores liquid during the cooling cycle.

With heat pump water source air conditioners the refrigerant holding capacity of the air side indoor coil is generally less than the water cooled heat exchanger. This means that when the system has a capillary tube or accumulator type refrigerant control the required refrigerant charge will be greater for the heating cycle than the cooling cycle. This is generally addressed by installing a suction accumulator to hold the excess refrigerant during the cooling cycle to prevent liquid flooding back to the compressor.

With the Aqua Systems "S-R" heat exchangers during the cooling cycle excess refrigerant is held in the water cooled condenser balancing the system charge between the heat and cool modes of operation.

In the heat mode when the water cooled condenser is performing as a liquid chiller the close approach between the leaving water and the refrigerant evaporating temperature also provides improved system operation.

Another exclusive feature of the Aqua Systems heat exchangers for heat pump systems is the unique water tube arrangement will allow the heat exchanger to be installed so that 50% water to refrigerant counter flow will maintain maximum system efficiency for both heat and cool modes of operation.

The "SR" series heat exchangers are also suitable for water cooled refrigeration systems fitted with an expansion valve refrigerant control as the receiver section will hold sufficient refrigerant to maintain a constant head of liquid to the expansion valve to ensure stable system operation.