



Air & Water-cooled Systems

Introducing the Condenser

Now that we have been introduced to the compressor, let us discuss the Condenser. If we pause to think about it, we will notice that the airconditioning process is a series of heat transfers. The heat from the conditioned space is transferred via the refrigerant, the condenser and the cooling tower to the outside air.

In the air cooled system, the heat from the conditioned area is transferred to the cold refrigerant warming it up. This warm refrigerant then sheds the heat to the air outside in the Air Cooled Condenser.

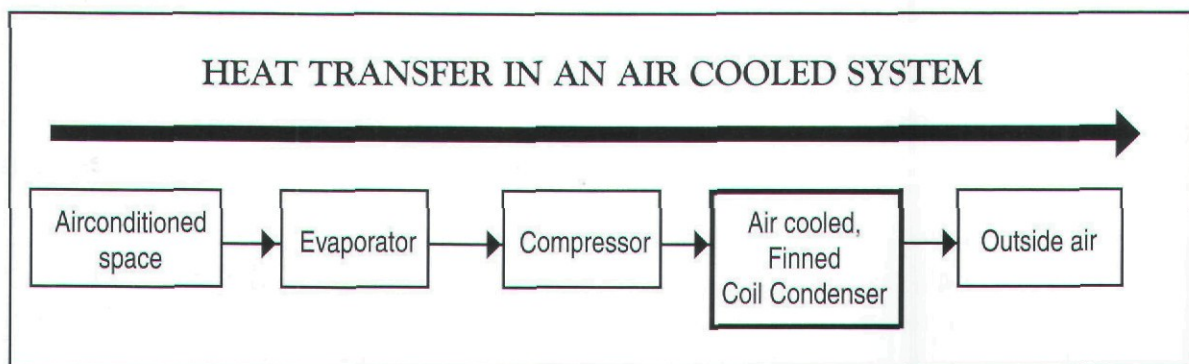


Fig. 35. Transfer of Heat in Air-cooled Condensers

In the water cooled system, the heat from the conditioned area is transferred to the cold refrigerant warming it up. This warm refrigerant transfers the heat to water in the Water Cooled Condenser thereby warming the water. This warm water in turn transfers the heat to the atmosphere through the cooling tower.

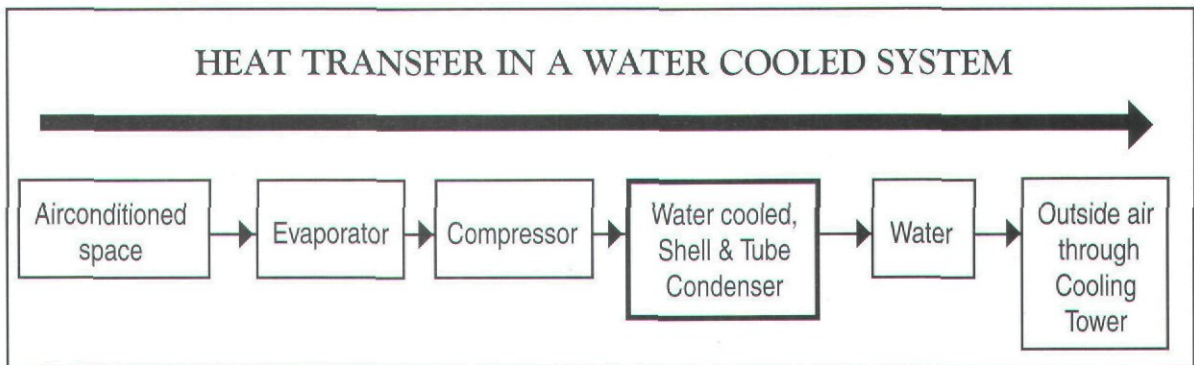


Fig. 36. Transfer of Heat in Water-cooled Condensers

How the Condenser is cooled

There are two ways in which the condenser is cooled:

1. By blowing or sucking air through it in an Air cooled condenser and
2. By pumping water through it in a Water Cooled Condenser.

How the Air Cooled Condenser is cooled:

An air cooled condenser consists of a set of finned copper tubes and a fan to draw or blow the air through this finned coil arrangement. The hot gas flows through the condenser inside the tubes while air is blown or sucked through the finned tube arrangement by a fan. The air which is normally at a temperature 10°C to 12°C lower than the gas, picks up the heat from the gas making it condense inside the tube. Air cooled con-

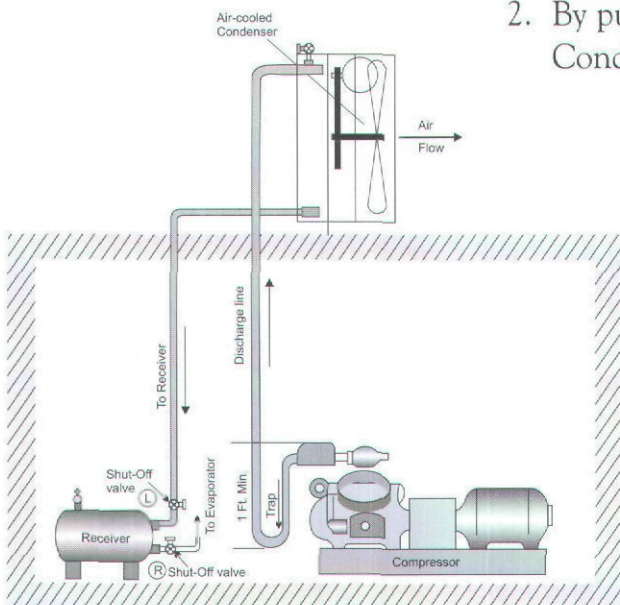


Fig. 37. Air-cooled Condenser operation

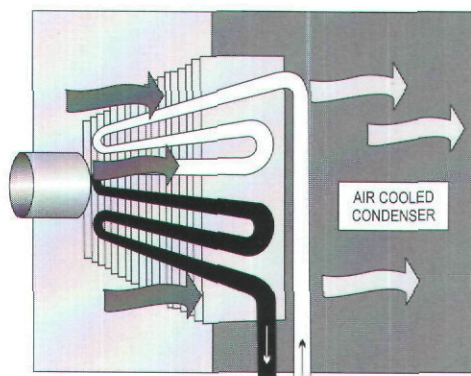


Fig. 38. Air-cooled Condenser - a closer 'artist's' view

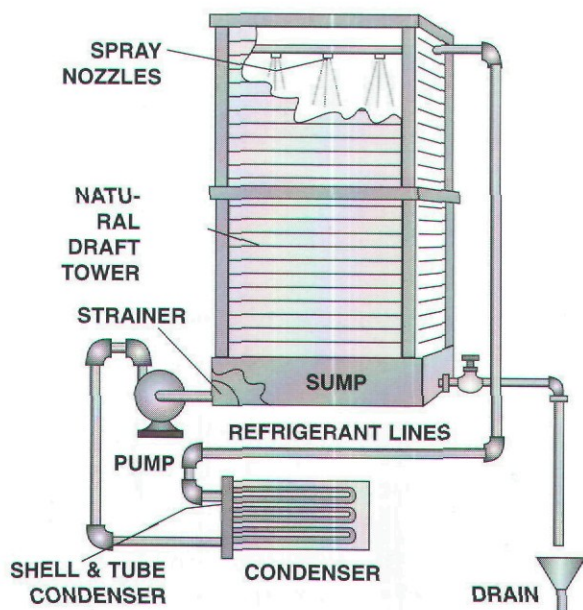


Fig. 39. Water-cooled Condenser

condensers are very common for window, split and packaged airconditioners and are now becoming popular for central plants also.

However, because of their superior efficiency, water-cooled plants are preferred, where adequate water is available.

How the Water Cooled condenser is cooled:

In a water cooled condenser, water is pumped through the tubes of a shell & tube condenser using a water pump and the refrigerant is passed through the shell. This condenser is also called '**Heat Exchanger**' because this is where the refrigerant and the water exchange heat with each other. On giving away some of its heat to the water, the refrigerant condenses in the shell. The water, which gains some heat in the heat exchanger, travels to the 'cooling tower' where part of the water evaporates in contact with air, cooling the remaining water which is once again circulated through the heat exchanger.

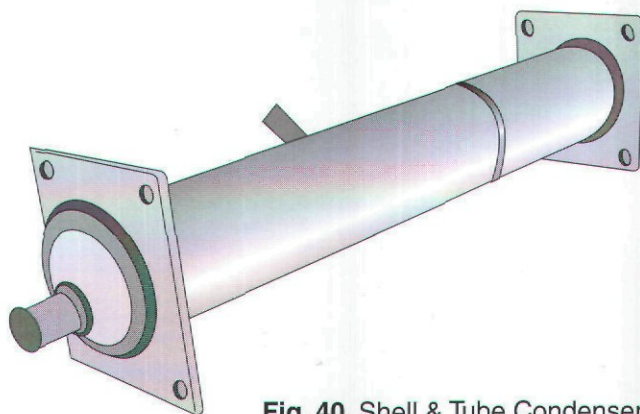


Fig. 40. Shell & Tube Condenser