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Experiment : 2

Object : To study the construction working principle of the desert cooler of traditional cooler.

Apparatus Required :

S No.	Apparatus Name	Rating	Quantity
1	Desert cooler		1
2	Test lamp	40 watt	1
3	Screw driver		1
4	Power supply	230V/50Hz	--

Theory :

Desert Cooler

Desert coolers are based on the simple principle that when unsaturated air comes in contact with water, the water evaporates. In the process, the moisture content of air increases, while its temperature decreases. The resulting cold but moist air is used for providing cooling. Thus a desert cooler is a simple device, which consists of an arrangement for blowing dry and hot air over a wet surface and an arrangement for keeping the surface wet continuously. The cooler normally consists of a blower and a pump. Desert coolers are economical (both initial and running costs are low) and are effective in hot and dry areas. They are not effective in humid areas.

Principle Of Working

As the name implies , it is suitable for places where the humidity is quite low and temperature quite high. These conditions are in conformity with desert areas. Hence the coolers are called â€˜Desert coolersâ€™. The principle on which a desert cooler works is â€˜ Evaporative coolingâ€™. Evaporative cooling is a process in which sensible heat is removed and moisture added to the air. When air passes through a spray of water it gives up heat to water, some of the water evaporated and picks up heat from the air equivalent to its latent heat . The vapour thus formed are carried along in stream. In this way air is cooled and humidified.

Contruction and working of a desert cooler

1 Blower/ Fan
2 Water circulating pump
3 Water wetted pads
4 Water tank
5 Float valve

The water is filled in the sump of the cooler from water supply mains , the level of which is controlled by a float valve. A water pump lifts the water and supplies it at the top of the cooler to the water distribution system which consists of small branches of copper pipe or so equipped with orifices which deliver equal amount of water to the troughs which in turns supply water to the wetted pads. The water which drops back from the pads is recirculated.Â The pump may be made of brass , stainless steel or even plastic. The blower pulls the air through the wetted pads and deliver it to space to be cooled through an opening in the fourth side of the cabinet of desert cooler. The air which is sucked through the pads is cooled by the principle of evaporative cooling .Â The blower gives adequate velocity to the air before it is delivered to the spaces to be cooled.

To have long life of the desert cooler and better performance , pads should be changed every year and holes for water distribution system should be cleaned. The tank should be cleaned just after the season and coated with corrosion resisting paint .

Classification

Fan in the vertical plane

The arrangement of the components is shown in fig. there is a separate motor for the pump and fan so they can be used independently. The arrangement of the components in a box providing 3 pads. The pump , pumps the water from the bottom tank to the top and water trinkles through the holes provided on the top of tank and falls passing the pads to the bottom tank.

Advantages of this type of cooler are:

The pump cannot be started without starting the fan , which prevents unwanted running of pump.
The system can be used as a cooler in hot summer and as a fan when cooling is not required.

Fan in horizontal plane

The wox type of the cooler falls under this class. The arrangement of the basic component is shown in fig. this differs from the previous one in fan arrangement. The pump and fan are mounted on same vertical shaft and run by a common motor. Hence the fan and pump cannot be operated seperately as in the previous arrangement.

Advantages of this sytem are

- 4 cooling pads instead of 3 , hence cooling capacity is more.
- Noise is less than other coolers.
- Unique omni directional air flow provides better air distribution in the room.

Cooler without water pump

The majority of the users in india are facing three major problems:

- The coolers consume more electrical energy and hence not economical.
- The water pumps of the cooler are submerged in water tanks get damaged frequently .
- The khus pads need frequent replacement thereby causing inconveinence.

To avoid such problems a new model known as â€˜Quality desert coolerâ€™ is developed.

Advantages desert cooler

- Less expensive to install because estimated cost is half that of central refrigerated air conditioning
- Less expensive to operate because estimated cost of operation is Â¼ that of refrigerated air
- Ease of maintanance because only two main parts fan &water pump which repair at low cost

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