Evaporative cooling system

How Evaporative Cooling Works

An evaporative cooler is essentially a large fan with water-moistened pads in front of it. The fan draws warm outside air through the pads and blows the now-cooled air throughout the house.

The pads can be made of wood shavings - wood from aspen trees is a traditional choice - or other materials that absorb and hold moisture while resisting mildew

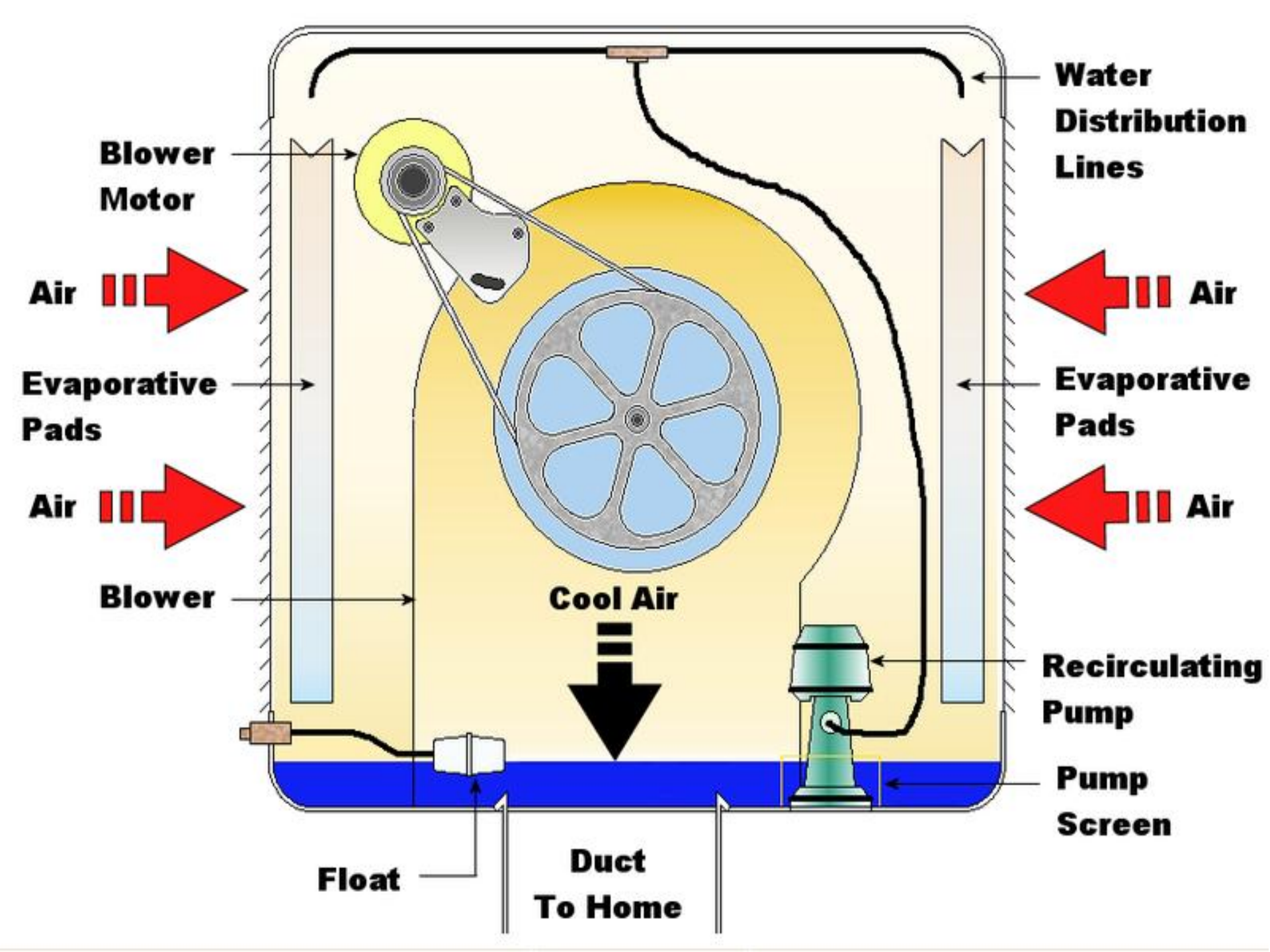
Small distribution lines supply water to the top of the pads. Water soaks the pads and, thanks to gravity, trickles through them to collect in a sump at the bottom of the cooler. A small recirculating water pump sends the collected water back to the top of the pads.

Since water is continually lost through evaporation, a float valve - much like the one that controls the water in a toilet tank - adds water to the sump when the level gets low. Under normal conditions, a swamp cooler can use between 3 to 15 gallons of water a day.

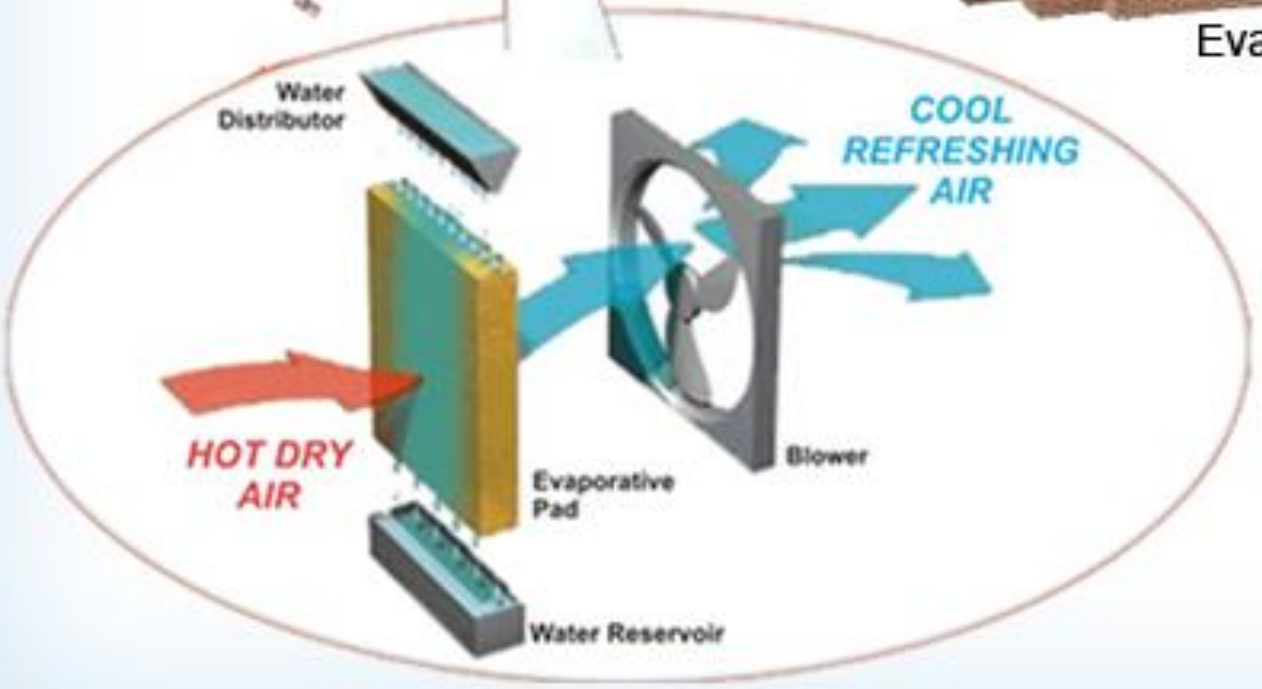
A large fan draws air through the pads, where evaporation drops the temperature approximately 20 degrees. The fan then blows this cooled air into the house.

Small units can be installed in a window, blowing cooled air directly into a room. Larger units can blow air into a central location, or the air can travel through ductwork to individual rooms.

Normal air conditioning is a closed system, taking air from inside a house and recycling it. For air conditioning to function properly, doors and windows should be closed. Evaporative cooling, however, takes air from outside the house. For evaporative cooling to work properly, the cooled outside air must be allowed to escape. By choosing which doors or windows in your home you leave open, you can to help direct the flow of cooled air to areas where it is needed.


Water
Distribution
Lines
Blower
Motor
Air
Air
Evaporative
Pads
Evaporative
Pads
Air
Air
Blower
Cool Air
Recirculating
Pump
Pump
Screen
Float
Duct
To Home

Evaporative Cooling Pad



Well Do Swamp Coolers Cool?

The temperature of air coming out of an evaporative cooler obviously depends on the temperature and the humidity of the air going in. The evaporative cooler can deliver comfortable air under a wide variety of typical summertime temperature and humidity ranges. See the fig.

In addition to the dropping the temperature of the air, evaporative cooling offers an additional cooling benefit. The constant movement of the air created by the blower - the cooling breeze it creates, if you will - makes the occupants of a room feel 4 to 6 degrees cooler than the actual temperature. This is the same effect you feel when you turn on a ceiling fan or a simple window fan. For this reason, the "effective temperature" created by an evaporative cooler will feel 4 to 6 degrees cooler than temperatures shown on the chart.

An added benefit of evaporative cooling is that it works best in the hottest time of the day. As the temperature outside increases as the sun climbs, the humidity normally drops. In the early morning, for example, the temperature may be 70 degrees, with a relative humidity of 60 percent. By mid-afternoon, when the temperature has climbed to 90 degrees, the humidity may well have dropped to 30 percent - conditions that make evaporative cooling work more effectively.

Temperatures Delivered by Evaporative Coolers

% Relative Humidity

Air Temperature

	2	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80
75	54	55	57	58	59	61	62	63	64	65	66	67	68	69	70	71	72
80	57	58	60	62	63	64	66	67	68	69	71	72	73	74	76	76	77
85	61	62	63	65	67	68	70	71	72	73	74	75	76	77	79	81	
90	64	65	67	69	70	72	74	76	77	78	79	81	82	83	84	86	
95	67	68	70	72	74	76	78	79	81	82	84	85	87				
100	69	71	73	76	78	80	82	83	85	87	88						
105	72	74	77	79	81	84	86	88	89								
110	75	77	80	83	85	87	90	92									
115	78	80	83	86	89	91	94										
120	81	83	86	90	93	95											
125	83	86	90	93	96												

Optimum conditions for Evaporative Coolers

Source: Ed Phillips, Arizona Almanac

Benefits of Evaporative Cooling

- Swamp coolers use as much as 75 percent less electricity as air conditioning does.
- An evaporative cooler costs about half as much as an air conditioner that will cool the same sized area.
- Evaporative coolers operate on 120-volt electricity, which means they don't need special high-amperage circuits like many air conditioners do. A swamp cooler can be plugged into a nearby outlet.
- Many people appreciate the fact that evaporative cooling adds moisture to the air, which helps to keep wood furniture and fabrics from drying out.

Drawbacks to Evaporative Cooling

- The main drawback of swamp coolers is that they depend on dry outside air to operate effectively. This is usually not a problem for most of Jordan.
- Evaporative cooling requires water to keep pads wet.

how to choose the right-sized evaporative cooler

For a swamp cooler to effectively cool, it must be the proper size for the job. A small portable unit, for example, will not adequately cool a large-sized room.

While the output of air conditioners are rated in BTUs (British Thermal Units), evaporative coolers are rated by CFMs (the cubic feet per minute of air that the cooler can blow into your home).

Whether it is for a single room or a whole house, there is a simple formula for determining the proper size of swamp cooler you need. Figure the cubic feet of space you want to cool, and then divide that number by two. The quotient will give you the CFM rating for the proper-sized swamp cooler.

For example, if you have a 1,500 square foot home with 8 foot-high ceilings:

1,500 x 8 = 12,000 cubic feet 12,000 / 2 = 6,000 CFM needed

The End

Done by : Ahmad Akram Almdallal

ID. No. : 200930050

Dr. Shatha Ammoura

- http://www.consumerenergycenter.org/home/heating_cooling/evaporative.html#top