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Reducing Moisture Content and Increase Cooling Efficiency in Air Cooler with Help of Two Stage Cooling System

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Abstract -Today global warming and an increase in the overall earth's temperature the air cooling/air conditioning system is a must for tropical countries but at the same time the cost of the air cooler/ air conditioning system is necessary and so to design such air cooler system which not only cools the system but also remove the effect of moisture. In the present work, the cooling of air takes place in two stages in the first stage similar to evaporative cooling and in the second stage with the help of a copper coil cooling will be made possible.

Key Words: Global warming, Air cooler, Humidity control, Two-stage cooling.

1. INTRODUCTION

Reducing Moisture Content and Increase Cooling Efficiency in Air Cooler with the Help of Two Stage Cooling System Which completely depends on two-stage air cooling. A 2-stage evaporative cooling system represents the most economical cooling system – utilizing evaporative cooling technology. This cooling option is much more energy efficient than cooling with refrigerant (standard air conditioning), but it is not suitable for all cooling applications. 2-stage evaporative cooling in terms of the stage of cooling that occurs. In the first stage, hot outside air passes inside the water-soaked cooling pad that is cooled by evaporation on the outside During this initial cooling phase, the incoming air stream does pick up extra moisture. In the second stage, the same air stream passes through a copper coil heat exchanger where the additional cooling takes place. A 2-stage evaporative cooling system can deliver cool indoor air with relative humidity in the 50%-65% range, while a direct system typically conditions the air at around 70% relative humidity

2. Plan of Work

For making this prototype we are using a variable-speed fan, submersible water pump, copper coil, honeycomb cooling pads, convergent nozzle, PVC pipes, and acrylic box.

In the first stage, the atmospheric air passes through the water-soaked cooling pad. The cooling pad is soaked by cool water which is supplied from the water tank and transfers water with the help of the pump. The temperature of the atmospheric air is high compared to water temperature. The hot air passes through the cool cooling pad where evaporative cooling takes place. Evaporation of water removes latent heat from the atmospheric air. In the second stage of cooling the cool air is supplied by fan transfer to convergent nozzle. The nozzle is connected to a copper coil. in a fluid medium in which the flow is mostly rotating around an axis line, the vertical flow occurs either on a straight axis or a curved axis. Due to that the moisture is reduced and extra cooling takes place.

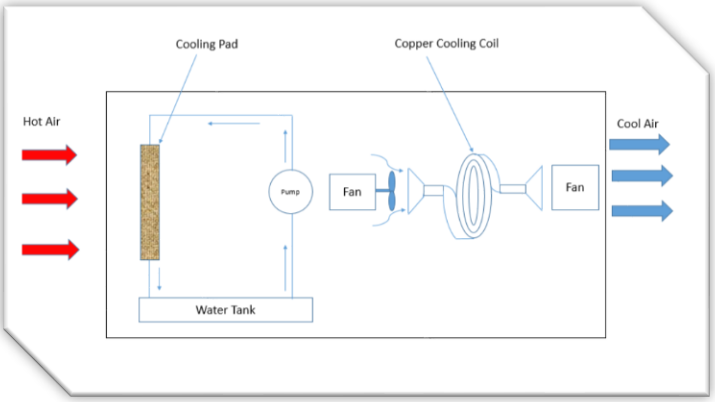

Figure-2.1 BLOCK DIAGRAM OF AIR COOLER

Aims and objective of the system: -

The main object of developing this system is to reduce the moisture from the cooler air and increase the efficiency of the cooler Two stages of cooling allow the use of energy-saving evaporative cooling technology for design conditions where direct evaporative cooling is inadequate

(1) The energy consumption is around half of that of air conditioning, while the capital cost is also significantly lower.

(2) In many cases the two-stage system can provide better comfort than a compressor-based system because it maintains a more favorable indoor humidity range. Hence, they can replace mechanical refrigeration in many applications.

(3) Since no refrigerant is used the system is environmentally friendly.

Simulation and Analysis (Software modeling):-

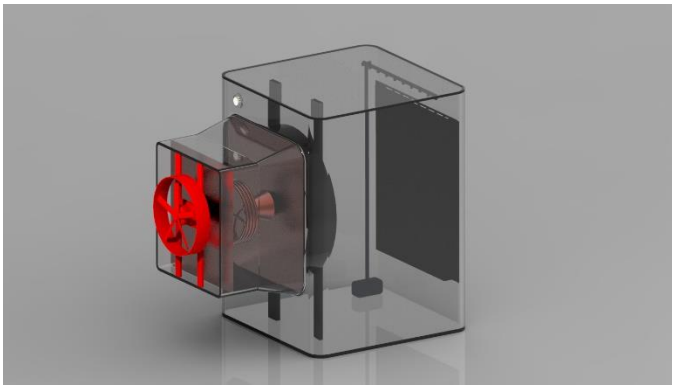

Figure-2.2: Simulation Model

Observation Table

Time	Air in temp.	Air out temp. Stage 1	Air out temp. Stage 2	Water temp.
0	35	35	35	20
2	35	32	31	20
4	35	29	27	20
6	35	27	25	20

Table 2.1

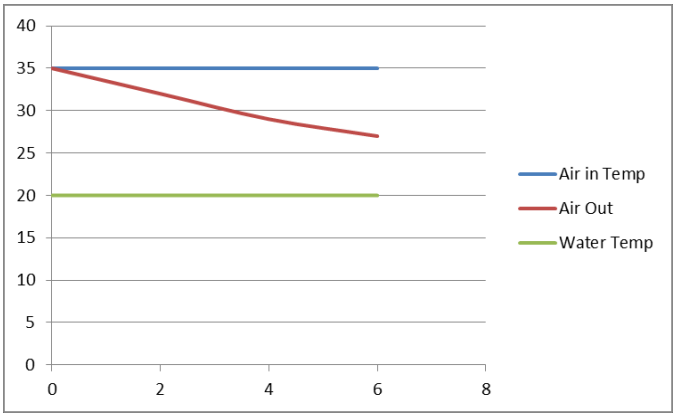

Chart 2.1 First Stage Cooling

In the above chart, the X-axis shows time and the Y-axis shows temperature. The above chart shows only the first stage of air cooling. During the second stage of air-cooling air is passed from a copper helical shape coil. And in the second stage of cooling, we obtain 25 degrees Celsius.

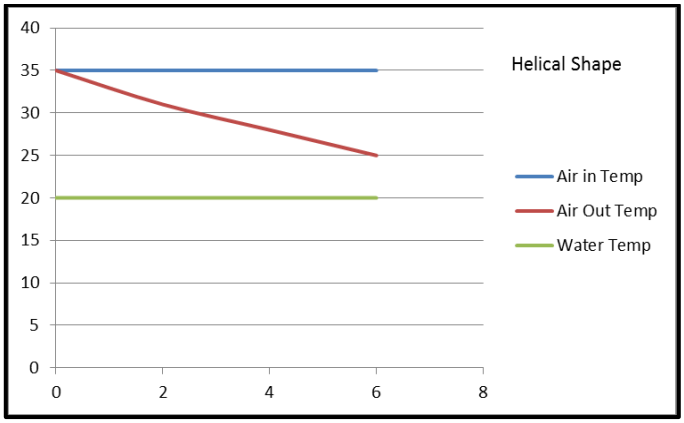

Chart 2.2 Second Stage Cooling

In the above chart, the X-axis shows time and the Y-axis shows temperature.

Design for ergonomics and Aesthetic: - Upgrading the air cooler design to make it suitable for every condition with special specification. the old air cooler mostly square and rectangular shapes and it provide odd look to the air cooler but in new generation cooler, the coolers use designer swing which are specially designed for that particular cooler which is most suitable for it and provide a decent look and safety. This also improves the cooler's look and design in the sense of dynamics.

Constructional Detail of Experimental Setup: - In the present work the proposed idea is to develop such air-cooling system that is moisture-free as well as compressor and to achieve the same vortex flow concept is used also to study the effect of various shapes on the thermal performance of the proposed the cooling system is studied experimentally

3. CONCLUSIONS

After making prototype of this air cooler, we have achieved few results like

(1) Reduce the moisture from the air.
(2) Increase the efficiency of air cooler.
(3) Improving cooling capacity.
(4) Cooling take place without refrigerant.
(5) Less power consumption. An evaporative cooler uses as much as 75% less electricity than air conditioning does.
(6) The noise of the system is also can be reduced by using noiseless fans.

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