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360 cooler cum Heater

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Abstract - The 360° air cooler and heater is an energy-efficient device designed to cool or heat air as needed, addressing the growing concern of escalating energy consumption and its impact on future generations. Unlike conventional air conditioning systems which contribute to global warming through Chloro-Flouro Carbon emissions, the 360° air cooler and heater operates by extracting latent heat of vaporization from air, reducing temperature and increasing humidity. This device is more efficient than traditional AC units, consuming significantly less electricity and emitting less heat. Additionally, it effectively cools air from all directions using chilled water, making it suitable for various climates. During winter, its efficiency remains high even in high humidity conditions, thanks to the incorporation of a heater coil, providing warmth when needed.

Key Words: Chamber, Exhaust fan, Heating coil, Khus-Grass, Pump.

1. INTRODUCTION

The evaporating air water cooler r is one of the earliest strategies employed by one for conditioning premises. It may be a process of adiabatic saturation of air when a spray of is made in 360 direction by the pump air is passed in all directions , initial cost of such a system is low & the operation is simple and cheap .Simple 360 evaporative cooling is achieved by direct contact of water particles and moving air stream .The minimum outdoor temperature required for successful 360 evaporation cooling is about 35 degree C . All though the 360 evaporative cooling does not perform all the function of true air conditioning but it provides consolation by sifting & circulation cooled discuss.

1.1 Problem Statement

In response to the prevalent power crisis and the importance of energy conservation, a project is proposed to design, develop, and fabricate a 360˚ air cooler cum heater. This innovative device aims to minimize operational and overall costs. While traditional coolers are effective only during summer, this device will offer heating capabilities for winter and monsoon seasons, maximizing its utilization throughout the year. The 360˚ design ensures uniform heating or cooling, allowing people to sit comfortably in any direction. This approach addresses energy conservation needs while enhancing user comfort in various weather conditions.

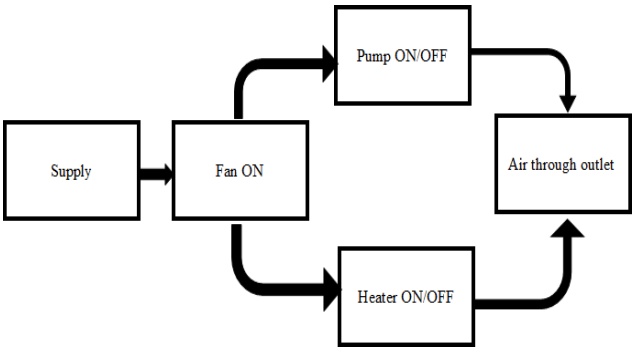
1.2 Objective

1. Develop a cost-effective, eco-friendly evaporative air conditioning system for hot, dry regions.
2. Save water and electricity by using a single cooler for multiple rooms in a home.
3. Design a cooler with 360° directional airflow.
4. Create a versatile cooler that provides both cool and hot air for year-round use

1.3. Working Principle

The process begins by activating the pump to draw water from the bottom tank, which is then directed onto stationary pads located behind two side doors via delivery pipes. Subsequently, the exhaust fan initiates, drawing atmospheric air through the wet pads. Cooling occurs as the air comes into direct contact with water particles. This process, known as complete contact cooling, saturates the air at its wet-bulb temperature, transferring sensible heat to water as latent heat. With time, the air becomes sufficiently cooled through

the 360° evaporative process, albeit with an increase in humidity. For enhanced cooling, ice cubes or chilled water can be added to the bottom tank.



1.4 Design Of Components

The major components that are employed in the fabrication of the 360⁰ air cooler cum heater are as follows

1) Motor 2) Fan 3) Cellulose Pad
4) Pump 5) Frame 6) Heating Coil
7) Sump

1.5 Description of Components

1. Motor

The model requires a single-phase induction motor with a B42 frame size, designed for high efficiency and reliability in air handling applications. It offers both open and closed enclosure options, with power ranging from 75W to 370W.

2. Fan :

For the model, an axial fan is chosen over a centrifugal fan due to its lighter weight and suitability for low-pressure, high-discharge applications. Axial fans pull air along the fan shaft and blow it along the axis of the shaft. When selecting a fan, factors such as volume flow rate, pressure, and brake power are crucial performance metrics to consider

3. Cellular pad

It is used because it has high efficiency and cooling rate. The thickness of cellular pad 50 mm .Its type are:

Khus grass ,Cellulose pads , Coconut coir

4. Pump

Electric pump is used. It has power 14W, having 1m head.

5..Frame

The material used for outline is MS or cast iron. As it has to support the other parts It should be strong to resist the force, stresses and vibration. And even because it is constantly in contact with wet environment it should too have high corrosive resistance.

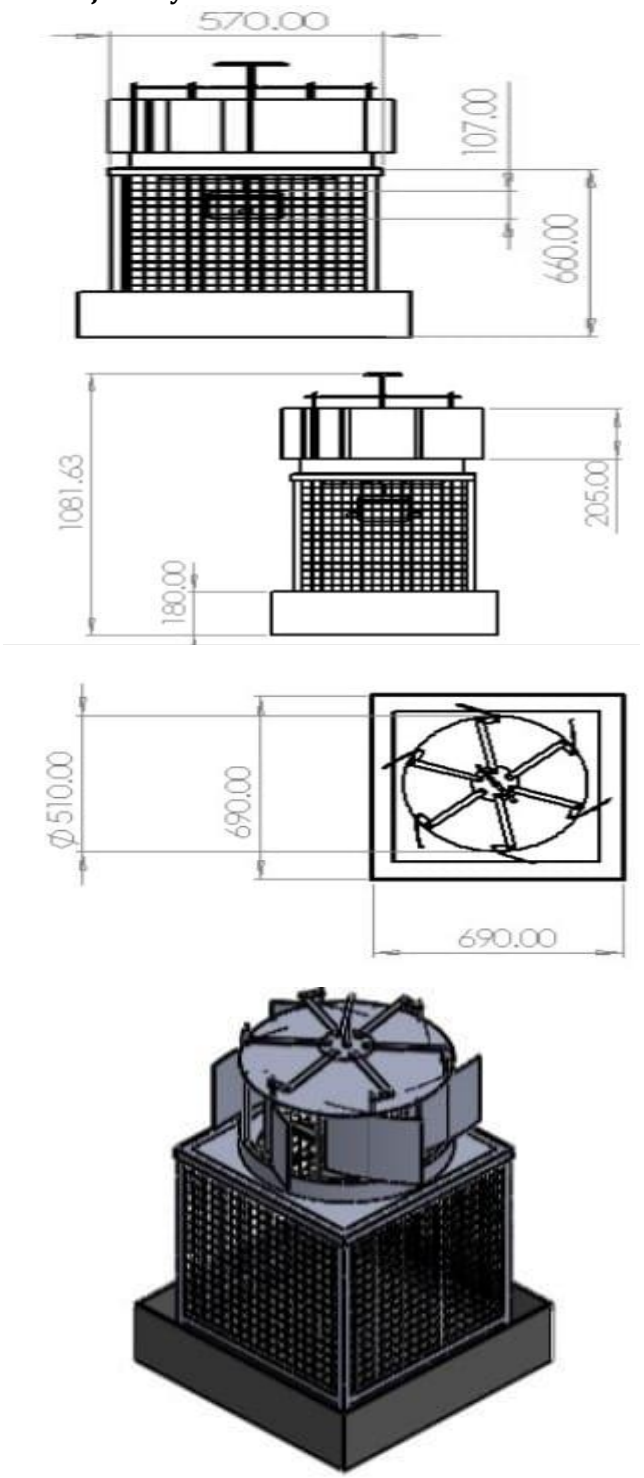
6.Heating Coil

For this model, the heating of air is achieved using an electric coil for its simplicity, efficiency, and low cost. The Ni-chrome coil is selected due to its high resistance and stability under high temperatures. This direct exposure to the heating element ensures quick response and longer lifespan.

7. Water sump

The material used for the water sump is MS .As plastic materials has leakage problems.

1.6 Project Layout



1.7 Based On Material Used

Plastic: The outer casing or body of the cooler cum heater is often made of durable and heat- resistant plastic. This material is lightweight, cost-effective, and can withstand temperature variations.

Metal Components: Internal components such as the heating element, fan blades, and heat exchangers may be made of metals like aluminum or stainless steel for their heat conductivity and durability.

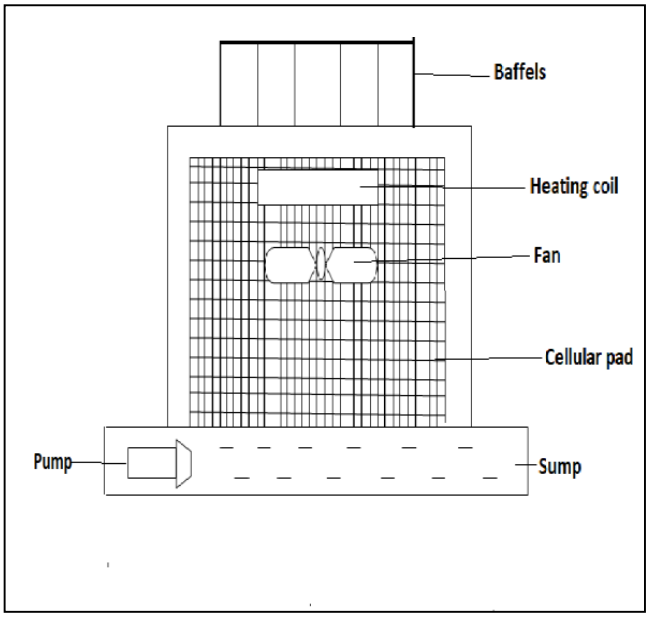
Ceramic: Some heaters utilize ceramic heating elements due to their efficiency in providing consistent and even heat distribution.

Electronic Components: Circuit boards and electronic elements within the device may be made from materials like fiberglass or other composite materials to ensure stability and reliability.

Insulation Materials: To enhance the efficiency of the heating function, insulation materials may be used to prevent heat loss and maintain a consistent temperature.

Cooling Mechanism: If the device includes a cooling function, it may have components like a water reservoir, cooling pads, or a refrigeration system. The materials for these

1.8 Working Operation



- 1st begin the pump which sucks water from foot tank which was as of now filled with water. Water goes on stationery pad which are placed on backside of two side door, through conveyance pipe
- After that, the exhaust fan begins &sucks the climatic air , which is passed through damp pad. In this handle cooling is accomplished by coordinate contact of water particles & moving air stream.
- In total contact prepare the air would ended up immersed at WBT of entering air .In other words sensible warm of air is carried by water within the frame of idle warm, when it is brought intimated contact with water.
- After a few time discuss may be sufficient cooled by 360 EVAPORATIVE forms which comes about in
- considerable increase of humidity. For superior impact include ice cube or chilled water in foot tank.

Working

I. supply on
II. In this venture the cooling of air is done by utilizing cold water or any other refrigerant which is circulated over the enveloping work for the reason of decreasing the warm within the including environment, where it is of uncommon significance in broadly spread ranges.
III. This venture comprise of Debilitate fan which sucks the air from climate.
IV. Fan is encompassed by vertical penetrable wood shavings on three sides.
V. These wood shavings are kept wet by trickling within the water tank or by gravity water scattering.
VI. Rather than mounting the fan in conventional way as in forsake cooler, it is mounted on a level plane, so that the air will be circulated in all heading.

1.10 Result

The temperature is lowered down from 35^{0}C to 20^{0}C, first by Cooling and humidity is increased from 75% to 85%.
Then due to the heater coil the humidity is lowered down to 65% and the temperature is still in the range of comfort air condition increased to 27^{0}C.

Trial on air cooler:
Initial room temperature (DBT) = 32 C. Relative humidity=60
Area of room = 400 ft, height = 20 ft.

Observation Number	Temperature in degree centigrade	Time interval in minutes
1	32.0	0
2	32.0	15
3	31.6	30
4	31.0	45
5	30.2	60
6	29.6	75
7	29.0	90
8	28.6	105
9	28.2	120

1.11. Conclusion

The cost of a standard air conditioner is around Rs. 28000/- and the cost of a refrigerator is approximately Rs. 6000/-; which calm expensive than 360 cooler .it provides us with both the offices at an affordable cost of approx Rs. 6000/- only.

From the show investigation it is evident that for drip sort 360 EVAPORATIVE cooling the performance characteristics cooling the performance characteristics can be related to the variables like and thickness and the air conditions such as humidity control and comfort. It is also possible to determine the optimum value of these design parameters but location and one needs to optimize the design parameters for comparing outdoor conditions.

The result also indicates that a impressive saving in power consumed is possible and at the same time the cooling effectiveness can be enhanced. The method detailed in the present study can be used to advantage in designing 360 EVAPORATIVE air cooler of larger capacity to economically cool bigger endorsers, because the various parameters can be changed with ease The approach can be employed to analyze any piece of equipment and move forward it's performance.

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