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PERFORMANCE TESTING OF MULTI UTILITY HYBRID COOLER

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ABSTRACT

The paper presents the detailed information about 'Multi Utility Hybrid Cooler (MUHC)'. We have designed this cooler by making modifications in the conventional desert coolers used in our country. This is a multipurpose cooler which gives air cooling effect, cooling water for drinking as well as provides cool space for storing perishable products.

Keywords: Radiator, Desert Cooler, Hybrid, refrigeration, evaporative cooling, Multipurpose.

I INTRODUCTION

In the North Western part of India, the humidity of air is quite low during summer season whereas the average temperature is 40^0C to 45^0C. It even reaches up to 48^0C to 50^0C in the month of June. To maintain comfortable condition in (i.e. temperature) in the summer season various types of appliances are used such as 'Air Conditioner', 'cooler'. This climate is most suitable for evaporative cooling. Fresh outside air is sucked through moist pads where it is cooled by evaporation of water and this cooled air circulated in a room or building by small fan or blower. Also evaporative cooling is the natural way of keeping water cool in summer season.

We have designed a "MULTI-UTILITY HYBRID COOLER (MUHC)"which is modification of the conventional cooler. It is Air Conditioner cum refrigerator for the people who cannot afford costly equipment's like air conditioner, refrigerator and other such appliances. The modified desert cooler is designed and developed to provide better cooling effect than the conventional. It also provides cold pure water for drinking purpose and storage for perishable items comparatively at low cost than refrigerator. Modification is carried out with the help of accessories such as radiator, copper tubes, water tanks, storage box and PVC pipes.

II OBJECTIVES

With the modified cooler, the following objectives can be achieved.

1. Air cooling effect
2. Cool water for drinking purpose.
3. Storage space for perishable goods.

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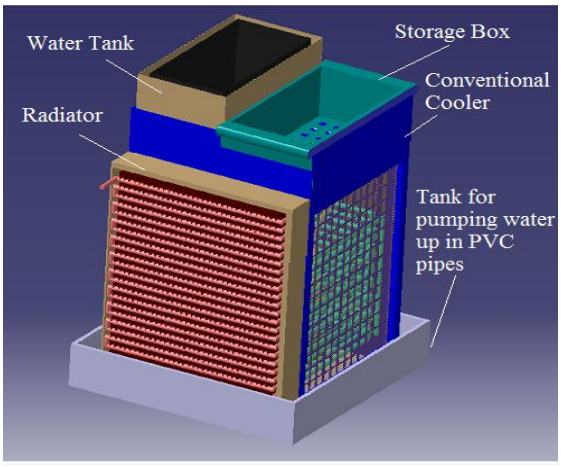
III HUMAN COMFORT

Temperature is the most significant component to the experience of comfort in a space. Our bodies perform within an internal temperature range much narrower than external temperatures. In the process our bodies' metabolism generates heat, which must dissipate into the surrounding air or surfaces. Humans maintain comfort levels in very diverse climates. When external temperatures are high, this process becomes more difficult and we may overheat or feel warm. When external temperatures are low, the rate of heat loss becomes more rapid, and we may feel uncomfortably cold. When assessing thermal comfort in a confined space, we must examine both the general temperature in the room, as well as the uneven distribution of heat in the room. Typically when people refer to temperature, they mean the temperature of the air; however, our experience of thermal comfort depends on more than simply air temperature. The mean radiant temperature entails averaging the temperatures of each surface in the room. Combined with the air temperature this produces an overall measure, the mean operative temperature. However, even this measure has its limitations, as how close a person will be to a particular surface is usually variable, and in these cases different surfaces will dominate at different times. Differences in temperature within a room or across a body can create a sense of discomfort. When temperatures from different surfaces diverge, we sense a surface as radiating heat or "giving off" cold. When the ceiling is the contrasting surface, we note discomfort when the ceiling is greater than 9˚ F (5˚ C) warmer or 25˚ F (14˚ C) colder than the other surface temperatures in the room. We allow a greater divergence of wall temperature from alternate surfaces temperature before we sense discomfort, 41˚ F (23˚ C) for warmer walls and 18˚ F (10˚ C) for cooler walls.1 As well, a vertical air difference from our feet to our head shouldn't exceed 5.5˚ F (3˚ C),2 otherwise the high temperature gradient highlights one part of the body as feeling notably warmer or colder than the other.



IV WORKING

1. Based on the working principle of evaporative cooling.
2. Cooling of water through radiator.
3. Cooling of perishable goods.

1) Cooler works on principle of evaporative cooling as shown in fig.

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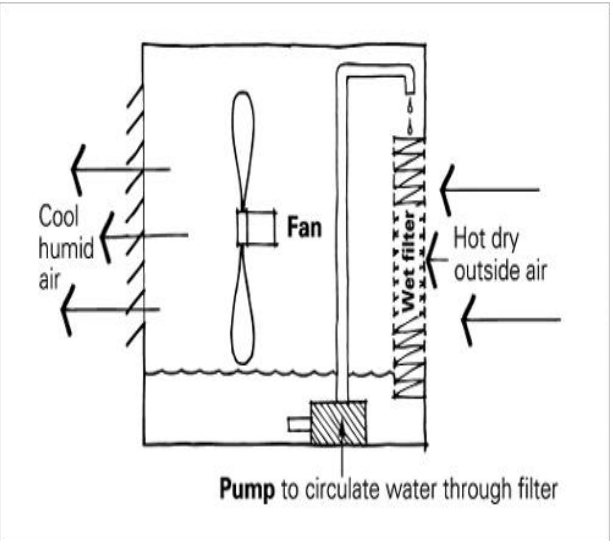
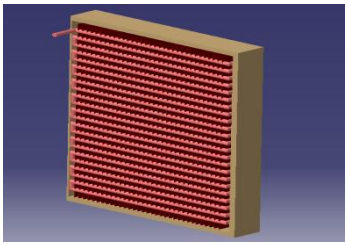


2) Working of Radiator for Water Cooling

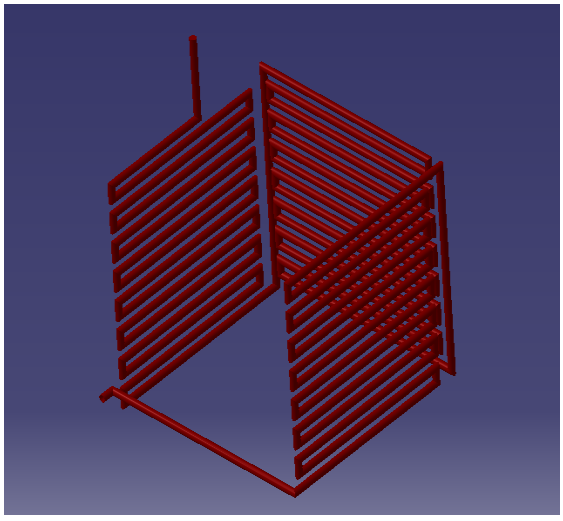


From upper tank water enters copper tubes and by gravity, it flows through those tubes.

Water inside cu-tubes loses temperature as water is trickled through PVC pipes as it is connected near to the aspen pads.

From there, it is taken inside the radiator where further more heat is lost and we get cold water.

Through the fins of radiator, air from cooler also cools down water more.



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3) Cooling of perishable goods.

- Here we are going to make small holes at the bottom of the storage box and walls of the box is sealed with insulating material.
- Through that holes air is going to come inside the storage box and thereby it cools the perishable goods kept inside it.
- The insulation helps to prevent the loss of heat i.e. maintains the low temperature inside the box.

V RESULT

1) Ambient temperature= 28^{o}c

2) Temp. Of water storage tank = 23.1^{o}c

3) Temp. Of drinking water at outlet= 17.7^{o}c

4) Temp. Of cooled air =17.3^{o}c

5) Temp. Inside the perishable storage box=17^{o}C

6) Temp difference of air = 28^{o}c-17.3^{o}c = **10.7^{o}C**

7) Temp difference of water 23.1^{o}C- 17.3^{o}C=**5.3^{o}C**

8) Temp difference of storage box = **11^{o}C**

VI CONCLUSION

So here we conclude that the "MUHC" is a multi functional device serving three functions at time which makes it economical to use and can be afforded by poor people in our country. As it shown in our result almost there is much temperature difference upto 10^{0}C of air which will provide the great comfort at the low consumption of energy as well we get the water at almost 17.7^{o} C which can quench the thirst. The temperature inside the storage box can be lowered more hence the result are satisfactory and the system is running efficiently.

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