"MULTIPURPOSE EVAPORATIVE AIR COOLER"

Subodh D. Bihade[1], Gopal B. Bodkhe[2], Yogesh U . Kotkar[3], Amit B . Mahajan[4]

1 U.G. Student, Department of Mechanical Engineering, Shreeyash College of Engg.& Tech. Aurangabad, Maharashtra, India1
2 U.G. Student, Department of Mechanical Engineering, Shreeyash College of Engg. & Tech. Aurangabad, Maharashtra, India1
3 U.G. Student, Department of Mechanical Engineering, Shreeyash College of Engg. & Tech. Aurangabad, Maharashtra, India1
4 U.G. Student, Department of Mechanical Engineering, Shreeyash College of Engg. & Tech. Aurangabad, Maharashtra, India1

ABSTRACT

Air Cooler is one of the appliances that keeping the atmosphere lower than surrounding temperature. . This project is to design and develop a low cost air cooler which can be used in houses and office Secondary researches have been carried out to collect data regarding the present design of air cooler. Various types of air cooler available in the market have been identified. Up to this point we have considered fossil-fueled heat engines that are currently in use. These devices have provided society's answers to the thermodynamic question: How can the chemical energy of fossil fuels be converted into mechanical work and motive power? Let us now turn our attention to another great thermodynamic question: How can thermal energy be transferred from cold to warmer regions? The well-known clausius statement of the Second Law of Thermodynamics asserts: It is impossible to construct a device that, operating in a cycle, has no effect other than the transfer of heat from a cooler to a hotter body. Thus the clausius statement tells us that energy (heat) will not flow from cold to hot regions without outside assistance. The devices that provide this help are called refrigeration units and heat pumps. Both types of devices satisfy the Clauses requirement of external action through the application of mechanical power or natural transfers of heat.

Keyword : - *Copper tube ,Air cooler , Cooler motor, Submersible pump, tank*

---

1. INTRODUCTION:-

After exploring all the possibilities in the areas in which the temperature level is as high as that cannot be tolerated for survival of beings and Jalgaon coming under the highest temperature zone in Maharashtra, we had come to the conclusion that our findings in making evaporative cooler in split unit would certainly be helpful to the inhabitants of the area not only for controlling the humidity level in the areas bound for accommodation but also for the industries where this coolers can be utilized for the commercial purposes. Other systems that are occasionally used in special applications include thermoelectric coolers the cyclic integral of the heat transfer, and thus the network, becomes negative. This implies heat rejection at higher than the lowest cycle temperatureEnergy consumption all over the world is increasing rapidly and there is a pressing need to develop ways to conserve energy for future generations. Large portion of electrical energy produced mostly by fossil fuel. India's energy demands are expected be more than double by 2030, and there is a pressing need to develop ways to conserve energy future generations. This implies that we have to look total electricity utilized in government buildings in India is wasted due to unproductive design, resulting in an annual energy related financial loss of about Rs. 1.5 billion. Conventional heating ventilation and air conditioning systems consume approximately 50% of the

building energy. Conventional refrigeration based vapour compression air conditioning systems consume a large portion of electrical energy produced mostly by fossil fuel. This type of air conditioning is therefore neither eco-friendly nor sustainable. As we known that clauses statement heat will not transfer low temperature source to high temperature source without external supply. In our project we have use copper tube to for heat transfer from normal water to cold water with cooling effect of cooler internal surrounding temperature. That will gives the cooling effect in the form of cold water. Cold water is the output of ours project. Because of heat is transfer from the cooler pad, atmospheric air, cooler inside temperature to the copper tube

2. LITERATURE REVIEW:-

J. K. Jain et al**.** [1] used one of the oldest principles of air conditioning known to Man, cooling of air by the evaporation of water. It is the most common form of house hold cooling found in arid areas. The popularity of evaporative cooling in such areas is due to its relatively low initial cost and operational cost compared to refrigerated cooling. Conventional direct evaporative coolers consist of a water reservoir, a pump that draws water from the reservoir and discharges it through spray nozzles directly into the air stream or through the cooling pads. Now a days most of the buildings and offices use conventional air conditioning systems which are based on vapour compression refrigeration system. These systems consume substantial power and they may be harmful to environment also. In developing country like India, majority of population depend on low cost cooling devices such as direct evaporative cooler. Therefore it is very much needed to develop improved/more efficient coolers. Several researchers have made attempt to develop evaporative coolers by way of adding/modifying designs.

3. COMPONENT:-

3.1 Fan:-

Figure no: 3.1 Fan

Specification of Fan
Exhaust Fan:-152.4 mm
1500 rpm, 1 phase, 4 pole
Electric type fan: - 220/240V, 50Hz, AC Power- 18W

3.2 Submersible Pump:-

The Pump is used to circulate the water through the pad of Desert Cooler

Figure no: 3.2 Submersible Pump

Specification of Pump
Power Consumption:-18W Voltage:-AC 220V
Outlet Nozzle Size:-½"
Maximum Head:-1.5m (5 Ft.) Maximum Flow: - 750 L/H

3.3 Copper tube:-

Figure no: 3.4 Copper Tube

Copper tube is used to heat transfer medium which is transfer of heat of normal water to cooler air and cooling pads and atmospheric air. In the United States, it is manufactured to meet the requirements of specifications established by ASTM International
Specification of Copper Tube:-
Thickness: - 8 inch
Length: - 30 feet

3.4 Tank:-

Figure no: 3.5 Tank

The above figure shows the actual picture of tank used in the cooler. The size for the same is 68x60x18 cm^3 and the capacity is about 80 litres. It is large enough to hold a good quantity of water. The capacity of tank may range from 80 to 120 litres. The water being circulated after every cycle falls back in to the tank and constant circulation is maintained. As the water goes on evaporating slowly and slowly the water content in the tank goes on decreasing. Hence the tank should be refilled with water after a definite quantity of time, which depends on the no. of hours of cooler use. More is the use, quicker the tank gets empty. The tank is generally made of galvanized sheet metal but it is not at all compulsory to use this kind. Even the tanks can be used. A drain valve should be necessarily present in the tank so as to. it has refill after when it is empy generally 5 to 6 hr are required and it's depends on use.

3.5 Cooling Pad:-

Most of the cooling pads are made of aspen fibre andcellulose. A cellulose pad needs large air and water flow compering with aspen pad. cooling pad have a more efficiency of cooling capacity also. the temperature is reduce up to 10 to 20^0 c the efficiency is more of 4 to 6 inch cooler. cooling pad also more air flow that gives high performance.

4. PROJECT SETUP:-

Figure no: 4.1 Front View of Project

It consists of following components:

1. Conventional air cooler
2. two submersible pump
3. copper winding of pad
4. two storage tank
5. piping connection

4.1 Working:-

The experimental setup of project is as shown has the following functioning. The cooler in a initial stage is set on, then the fresh drinking water from the storage tank 1 is allowed to pass through the copper tubes by means an of an artificial tube connected as a medium between the copper tube and the storage tank 1. The fresh water flowing through the copper tubes gets the cooling effect due to cooler colder temperature, and hence the cooled water from the copper tubes is allowed to pass through the exit by means of artificial tube connected to the storage tank 2. This cooled water is then collected in a storage tank 2. In addition to the setup, an inlet drawer is provided in the cooler , the purpose of this drawer is to store the food products like fruits and vegetables which are also cooled due to chilling effect created in the cooler. In this way the experimental setup works.

5. OBSERVATION TABLE & RESULTS:-

5.1 Observation:-

Sr..No.	Time in (min)	T_1	T_2	T_3	T_4	T_5	T_6	T_7	Stop Watch (sec)
1	0	30	30	29.8	29.9	34	30	34	60
2	20	30.2	29.5	29.8	29.8	33.9	29.8	34	60
3	40	30.1	28.2	29.6	29.6	33	29.5	34.5	60
4	60	30.2	27.4	29.2	28.9	32.5	28.8	34.8	60
5	80	30	26.1	29	28.3	31	28.5	35	60
6	100	30.1	25.5	28.5	28.2	31.5	28	35.2	60
7	120	30.2	24.8	28.1	27.8	30.9	27.8	35.4	60
8	140	30	24.1	27.6	26.4	30.1	26.5	35.9	60
9	160	30.2	23	26.1	25.1	39.7	25	36.2	60
10	180	30.3	22.7	26	24.5	29.2	24.2	36.5	60
11	200	30.3	21.1	25.5	24.9	28.9	24.8	36.8	60

Table no:3.7

Where,
T_1-Drinking water temp in ^{0}c (inlet temp)
T_2-Drinking water outlet temp in ^{0}c
T_3- Temp of freezer section (storage cabin)
T_4- Water outside tank
T_5- Room temp after working
T_6- Temp of water at base tank
T_7-Room temp before working

5.1 Result:-

From the above table we reach to the following result that the temperature of the water at the base of tank decreases from 30˚ to 24.8˚.

6. ADVANTAGES AND DISADVANTAGES:-

6.1 Advantages:-

1) Its initial and running cost is low.
2) Unlike air conditioners, air coolers do not require refrigerants and hence ecofriendly.
3) It is comparatively less bulky..
4) No separate electrical connections are required for installing an air cooler. It can work at normal voltage and frequency.
5) Power consumption is low.
6) Danger of leakage of toxic refrigerant is not present.
7) The expensive insulation for the walls, ceiling etc. is not required

6.2 Disadvantages:-

1) Humidity control is not possible.
2) It can not be used effectively in regions with high humidity.
3) It may not be suitable for people suffering from Arthritis, Bronchitis, Asthma, etc.
4) After regular intervals, the cooling pads have to be changed and the tank has to be cleaned.

7. CONCLUSION:-

From this setup, we are getting cool air and cool drinking water simultaneously. Also, we had made a provision of a rack for keeping the vegetables, fruits etc inside the cooler itself, where the air temparature is lower than that of surrounding atmosphere.

This setup, thus, is economical for those who can't afford refrigerator. Also, we are able to reduce the total space requirement with the help of this setup.

In power requirement is less than the refrigerator in our project we have got the result up to 7^0c cold than the normal water temperature in 3 hr 40 min reading. the cooling effect is also incrising up to the 10^0 c to 12^0c while taking the reading 6 hr to 7 hr .

No pollution in and eco friendly to atmosphere so no green house effect

8. ACKNOWLEDGEMENT:-

With a profound feeling of immense gratitude and affection, we would like to thank our project guide **Prof. A. U. Karadkhele** for his continuous support, motivation, enthusiasm and guidance. His encouragement, supervision with constructive criticism and confidence enabled us to complete this project.

We also wish to extend our reverences to **Prof. G. S. Dhage** (Head of Mechanical Engineering Department) for motivating us to put our best efforts in this project work.

We express our deep gratitude towards **Dr. R. S. Pawar** (Principal) for constant motivation and providing necessary infrastructure.

We express our admirations for **Prof. K. T. Patil** (Project Co-ordinator) for his valuable advice and support throughout this venture.

Finally, graceful thanks to family, friends, colleagues and everyone who has directly or indirectly contributed to make this project a success.

9. REFERENCES :-

[1]. J.K.Jain , D.A. Hindoliya “Development and Testing of Regenerative Evaporative Cooler” International Journal of Engineering Trends and Technology, Volume3 Issue 6 JUNE 2012999999

[2]. T. Ravi Kiran, S.P.S. Rajput “Cooling Capacity and Energy Saving Potential of Dew Point Evaporative Cooling System for Indian Buildings” International Journal Of Renewable Energy Research , Vol.3, No.1, DEC.2012.

[3]. J.K.Jain , D.A. Hindoliya “Development and Testing of Regenerative Evaporative Cooler” International Journal of Engineering Trends and Technology, Volume3 Issue 6 JUNE 2012999999

[4]. Chuck Kutscher and Mark Eastment, “Projected Benefits of New Residential Evaporative Cooling Systems ” October 2006, NREL/TP-550-3934