

DESIGN AND FABRICATION OF MINI AIR COOLER

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Abstract - The air conditioner and air cooler are widely used in the world. These electrical devices consumed more electrical power and it is not benefit for the poor people. In practice power shortage is also occurred. These problems are rectified by modification of ordinary table fan. In summer season, the ordinary table fan gives small amount of cold air in the room. So the table fan is modified by using copper tube with fins and special design Cooling Chamber. In this project the cooling of air by using cold water or any other refrigerant which is circulated in the copper tube for the purpose of reducing the heat in the surrounding environment, where it is of great importance in widely distributed villages with little or no rural electrification and also in the urban areas where power shortage is often in practice.

Keywords : Air Cooler, Fins, Table Fan, Hose Pipe.

1.INTRODUCTION : World always trying to invent new one. Somebody tries to find new one and tries to modify an ordinary one to implement a technology. Energy plays an important role in the material, social and cultural life of mankind. This is the result of population growth and increase in the standard of living which is directly proportional to energy consumption. In practice air conditioner and air cooler are widely used in the world. These electrical devices consumed more electrical power and it is not benefit for the poor people. In practice power shortage is also occurred. These problems are rectified by modification of ordinary table fan. In summer season, the ordinary table fan gives small amount of cold air in the room. So the table fan is modified by using copper tube and Special design Cooling Chamber. In this project the cooling of air by using cold water or any other refrigerant which is circulated in the copper tube for the purpose of reducing the heat in the surrounding environment is of great importance in widely distributed villages with little or no rural electrification and also in the urban areas where power shortage is often in practice. In this project the ice cooler chamber for storing the cold water or cold ice bars or ice cubes which whose temperature decrease as time passes. This cold water or refrigerant is circulated through the copper tube with help aquarium pump which kept water cold for long times. The fan blowing against the copper tube which gives more cooling effect of air in the surroundings.

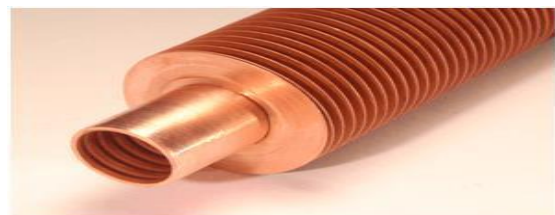
1.1 AIR COOLING

Air cooling is a method of dissipating heat. It works by making the object to be cooled have a larger surface area or have an increased flow of air over its surface, or both. An example of the former is to add cooling fins to the surface of the object, either by making them integral or by attaching them tightly to the object's surface (to ensure efficient heat transfer). In the case of the latter it is done by using a fan blowing air into or onto the object one wants to cool. The addition of fins to a heat sink increases its total surface area, resulting in greater cooling effectiveness.

In all cases, the air has to be cooler than the object or surface from which it is expected to remove heat. This is due to the second law of thermodynamics, which states that heat will only move spontaneously from a hot reservoir (the heat sink) to a cold reservoir (the air).

1.2 INTRODUCTION TO FINS

In the study of heat transfer, fins are surfaces that extend from an object to increase the rate of heat transfer to or from the environment by increasing convection. The amount of conduction, convection, or radiation of an object determines the amount of heat it transfers. Increasing the temperature gradient between the object and the environment, increasing the convection heat transfer coefficient, or increasing the surface area of the object increases the heat transfer. Sometimes it is not feasible or economical to change the first two options. Thus, adding a fin to an object, increases the surface area and can sometimes be an economical solution to heat transfer problems



2. EXPERIMENTAL SETUP

The components are placed at their positions. When the pump is switched ON, thus the water circulates in copper tube, which is mounted at front face of table fan.

The table fan is switched on. The air coming from the exhaust fan passes on the surface of copper coil and aluminium fin. The heat transfer takes place from low temperature to high temperature that is copper coil absorb the heat from air and given to the refrigerant liquid (water) which is flowing in the coil. Since, fins are used in order to increase the heat transfer rate & surface area . Thus, heat transfer and effectiveness is calculated.

Table-1: COMPARISON BETWEEN COPPER AND ALUMINIUM

	copper	aluminium
Density kg/m ³	8,920	2,700
Thermal conductivity, K W/m k	401	204.4
Manufacturing	Extrusion	Extrusion
Joining	Tube expanding combined with soldering (for operating temperatures below 450oC), tube expanding combined with brazing (for operating temperatures above 450 oC), threaded connection	Welding, threaded connection, hose clamp

OBJECTIVE

1. To achieve 8°C to 10°C of temperature drop by using simple mechanism.
2. To achieve optimum design with minimum capital investment.
3. To utilize various resources from home and surrounding effective manner.
4. To present this innovative idea in various engineering colleges .
5. To decrease the room temperature.
6. To increase the efficiency and effectiveness of ordinary fan.

METHODOLOGY

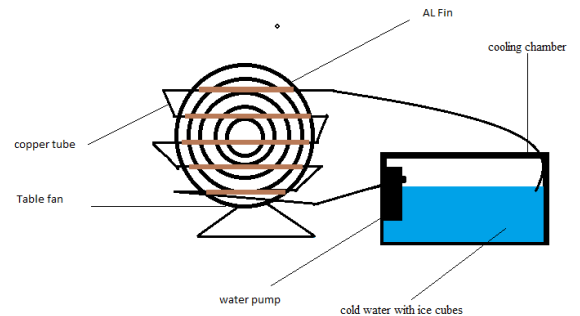
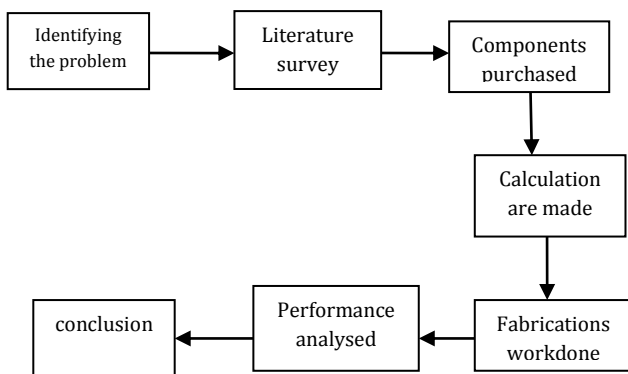


Fig -1: Project Layout



Fig -2: Fabricated Aluminium Fin

The copper tube is inserted into the hollow aluminium rod, where the water is to flow inside the copper tube which is placed inside the aluminium rod. The fabricated fin is placed in the front panel of the table fan. This is fitted with table fan by using tag. connected is to be fitted with copper tube and hose pipe to avoid the leakage of cold water which is circulated in copper tube. Fin is placed in order to improve the heat transfer rate and effectiveness of table fan. Grinding is done at each end of copper tube and aluminium rod in order to get the fine finishing is done for required dimensions. After grinding process, copper tube is inserted inside the aluminium rod and fitted by means of glue. Then it is placed at the front panel of the table fan.

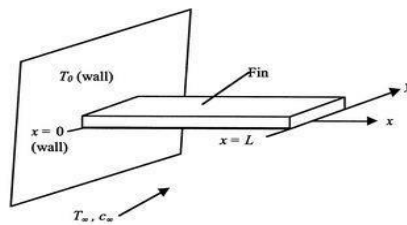
Reservoir setup is fabricated by means of welding process. Initially, the Steel material is chosen and it is assembled by means of welding process , according to required dimensions. Steel opener is placed at the top of the reservoir tank. At the four end the thermocol is fitted, in order to maintain the reservoir water temperature. And also thermocol is placed at back side of the reservoir opener also. The two holes are drilled in reservoir opener , where the hose pipe is inserted through the holes. The clamp is placed at the opener in order for easy opening and closing of the fan. Initially , material has been chosen for high thermal conductivity. Then, copper and aluminium has been chosen for better thermal conductivity. As, copper has higher thermal conductivity, the tube has been chosen as copper. And, also copper costs more. Then, fin which is to be used is then chosen and consider as aluminium. As aluminium has more thermal conductivity than other materials except copper, it is chosen. First , copper tube is bought and checked whether it satisfy our result or not.

3. EFFECTIVENESS OF FIN

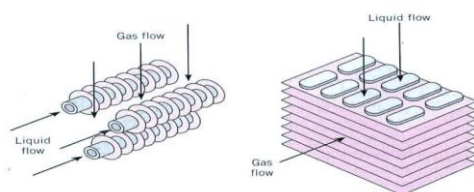
It is the ratio of the fin heat transfer rate to the heat transfer rate of the object if it had no fin.

$$E = \frac{\text{heat transfer with fin}}{\text{heat transfer without fin}}$$

Fins are used in a large number of applications to increase the heat transfer from surfaces. Typically, the fin material has a high thermal conductivity. The fin is exposed to a flowing fluid, which cools or heats it, with the high thermal conductivity allowing increased heat being conducted from the wall through the fin. The design of cooling fins is encountered in many situations and we thus examine heat transfer in a fin as a way of defining some criteria for design.



Rectangular fin



Typical finned-tube heat exchangers

3. CONCLUSIONS

Fins are made of aluminium, as it is fitted with copper tube. When the water is flow from reservoir to copper tube through the hose pipe. The water pump is placed at bottom surface in the reservoir with ice bar and cold water. When the motor is switched on, water circulates in the copper tube which is fitted with the aluminium rod(fins). When the table fan gets switched on , the air from the table fan which hits the aluminium fin. As, the water flown inside the fin, the temperature of the fin material gets decreased. So the air fringes which hits the aluminium fin also gets decreased and cold air which reaches the nearer people. Here, various calculations are made and heater transfer rate by using the fin and without using the fin is determined as the effectiveness gets increased by using the fin in the table fan

REFERENCES

1. Dr . S. Senthil, " HEAT AND MASS TRANSFER" A.R.S.publishers
2. C. P. Kothandaraman, " HEAT AND MASS TRANSFER DATA BOOK" , New age international publishers (seventh edition)
3. R.K.Rajput , "HEAT AND MASS TRANSFER" .
4. Nag, P.K, "HEAT TRANSFER ", Tata McGraw Hill, New Delhi, 2002
5. Kothandaraman, C.P., "FUNDAMENTALS OF HEAT AND MASS TRANSFER", New Age International , new delhi 1998.
6. Holman, J.P., "HEAT AND MASS TRANSFER", Tata McGraw Hill, 2000
7. Venkateshan. S.P., "HEAT TRANSFER ", Ane Books, New Delhi, 2004