

Modified assembled air cooler project

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Abstract- Nowadays thermodynamics is fascinating area of research. Now engineers are searching new ways of improvement of A.C, fans, coolers etc and also trying to cut off the cost as possible. That's why we invented a technique where cooler goes to work as A.C. here cost of our product is also less.

Our paper describes design of *modified assembled air cooler*. A.C. are too much expensive nowadays and that's why people go towards coolers and fans. But some people have aluminum plate shade. In home so in summer fan gives hot air. So people use cooler but cooler needs water. But because of hot summer, water also gets hotter. So cooler also gives hot air instead of cool.

So people use ice in water tray of cooler. But always having ice slabs is not possible. That's why we invented our design where we get cool air without using any ice at all. We made and implemented in our college CAD lab.

Our project is cheaper than A.C. and works as A.C. so people can easily afford it. Handling it is very easy.

'Modified assembled air cooler is light in weight, compact in size and pocket friendly equipment which will provide us a comfortable environment.'

If we don't want extra cool air so we can also use the fan of it. If we need moisture and more cool air then we can switch to that specific mode.

I. INTRODUCTION

An air cooler works on the principle of evaporative cooling wherein evaporation of water is used to cool the air. A simple example of evaporative cooling is sweating in humans. As sweat starts to evaporate, it extracts the extra heat absorbed in it from the skin in the form of gas thus resulting in a cooling effect. In case of air cooler, warm yet fresh air from the environment passes through an evaporating media, cooling pads in this case through which water is moved with the help of a water pump. The flowing water extracts the heat from the warm air and starts to evaporate leaving behind cool, fresh and moistened air which is thrown via a fan into the room. Many air coolers today come with dedicated trays for adding ice cubes which helps in chilling the water and thus resulting in

fast and powerful cooling. The best thing about using an air cooler is that you can keep the doors and windows partially open to ensure a constant circulation of fresh air.

A simple on/off temperature controller is built in with the dc power supply Thermoelectric Air Cooling in home and offices. To design a cooling system using thermoelectric cooler (TEC) one has to know the basics of thermoelectric effect, thermoelectric materials and thermoelectric cooling. Thermoelectric effect can be defined as the direct conversion of temperature difference to electric voltage and vice versa. Thermoelectric effect covers three different identified effects namely, the Seebeck effect, Peltier effect and the Thomson effect. A thermoelectric device will create a voltage when there is temperature difference on each side of the device. On the other hand when a voltage is applied to it, a temperature difference is created. The temperature difference is also known as Peltier effect. Thus TEC operates by the Peltier effect, which stimulates a difference in temperature when an electric current flows through a junction of two dissimilar materials.

A good thermoelectric cooling design is achieved using a TEC, which is solid state electrically driven heat exchanger. This depends on the polarity of the applied voltage. When TEC is used for cooling, it absorbs heat from the surface to be cooled and transfers the energy.

Problem statement

Solapur comes in dry region. Because of tremendous heat increased in current year we have generated an innovative idea regarding our capstone project, A G Patil Polytechnic Institute comes in rural area and we found continuous load shading in the college. So we have decided to modify & prepare one cooler for mechanical department.

OBJECTIVES

1. Water tank/ reservoir is placed on the third floor on terrace. Because of heavy summer we get hot water.
2. So if we pour water in the water cooler we will not get cool air.

3. Ice will not easily available as a second substitute for cooler.
4. To solve this problem we designed our project.

II. METHODOLOGY

We are introducing this project of modified assembled air cooler and its real life working example for getting rid of putting ice in water tank of cooler to get cool air in hot regions in summer.

A Thermoelectric Air cooling prototype was designed and built which can be used for personal cooling inside the home. One TECs were used for achieving the cooling with a DC power supply through electronic circuit. It had been shown from testing results that the cooling system is capable of cooling the air when recalculating the air inside the home with the help of blower. TEC cooling designed was able to cool an ambient air temperature from 32°C to 25.8°C. Cooling stabilizes within three minutes once the blower is turned ON.



III. ACTUAL WORKING

When we start ordinary household cooler, only fan works. if we want cool air then we start pump. Because pump sucks water from water storage from bottom and transmit to upper side.

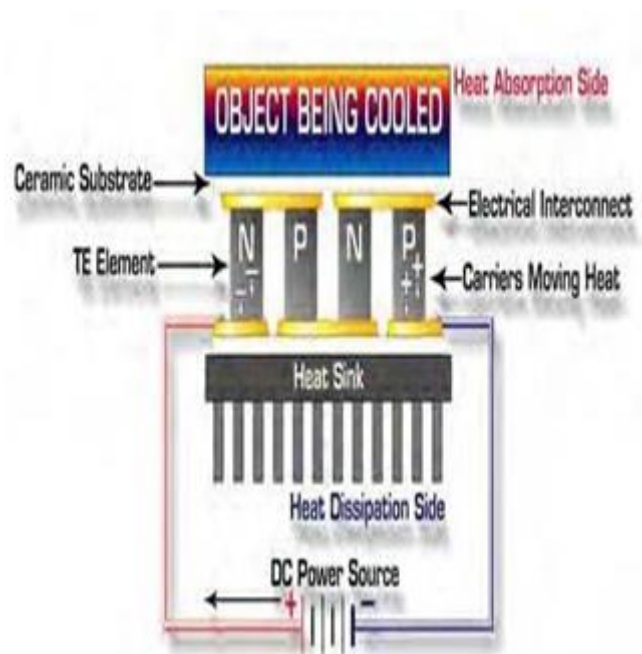
There is one flow divider placed which supply water to 3 individual pipes which has tiny holes. Which is placed on 3 walls of cooler having thick layer of wool. Water transmit from it and passes from top to bottom, so the air coming from outside to inside of the cooler get moisture and become cool. And that air is forced and passed towards face of cooler through the fan.

We all know how air cooler works. But we introduced some new part in it so it gives more cool air than ordinary cooler. In hot summer time also. If we pour water hot water because of summer effect then also our cooler transmits cool air to us.

We introduced new parts in our cooler

1. 3. Switches on cooler.
 - 1st for turn off or on for fan of cooler,
 - 2nd is for turning on water pump
 - 3rd switch is for turning on and off for peltier module. If we turn on this switch then we get chilled air like A.C.
2. Peltier module has 2 surfaces one side of it is hot and second side has cool surface because of peltier effect the temperature difference happens.
3. We placed fins called heat sink both sides of this module. And one 12v DC fan under hot surface for ventilation. Our opening of cold surface is at upper side on
4. Small water storage instead of water supplying pipes to walls of cooler.

Heart of project (modified assembled Air.Cooler)



Here the thermoelectric module plays important role in our project. Thermoelectric coolers operate according to the

Peltier effect. The effect creates a temperature difference by transferring heat between two electrical junctions. A voltage is applied across joined conductors to create an electric current. When the current flows through the junctions of the two conductors, heat is removed at one junction and cooling occurs. Heat is deposited at the other junction. The main application of the Peltier effect is cooling. However the Peltier effect can also be used for heating or control of temperature. In every case, a DC voltage is required.

Advantages of module

- No chlorofluorocarbons or refrigerant emissions
- Low maintenance
- Long lifetime
- Controllable
- Compatible with extreme environments or remote locations
- Capable of cooling far below ambient temperatures
- Performance independent of orientation

III. CALCULATIONS

The amount of heat removed or the cooling power was determined before selection of the TEC. Q_c which is the amount of heat absorbed was calculated using the equation ($Q_c = C_p \Delta T$).

Mass flow rate (\dot{m}) of air and is the product of density of air (ρ) and volume flow rate (Q). Density of air at 32°C was taken as $1.164 \text{ kg} / \text{m}^3$. Q was obtained by multiplying velocity of air pass through the rectangular duct of heat sinks and the Cross section area of a heat sink. It is denoted by the equation ($Q = V \times A$). Velocity of the air passing through the duct was measured using an anemometer and resulted in a reading of $5.2 \text{ m} / \text{s}$. Cross sectional area of the rectangular duct ($W \times H$) was calculated as 0.0042 m^2 and the volume flow rate was $0.02184 \text{ m}^3 / \text{s}$. Specific heat of air (C_p) at 32°C was taken as $1005 \text{ J} / \text{kgK}$. As discussed that the system ΔT is the difference between the ambient temperature and the temperature of the load to be cooled. It had been targeted to attain a temp of 25°C form the ambient temperature (32°C). In other words the input temperature from the blower fan is 32°C and the expected output is 25°C

$$(T_{in} - T_{out}) = 32^0 - 25^0 = 7^0$$

The amount of heat load for cooling the air through the rectangular duct was calculated as 178.7 W .

IV. DESCRIPTION OF HARDWARE

1. single stage thermoelectric module:



this module is heart of our system, here we used TEC1-12706 model of single stage peltier module is used. Because of peltier effect one surface is get cooled and second get

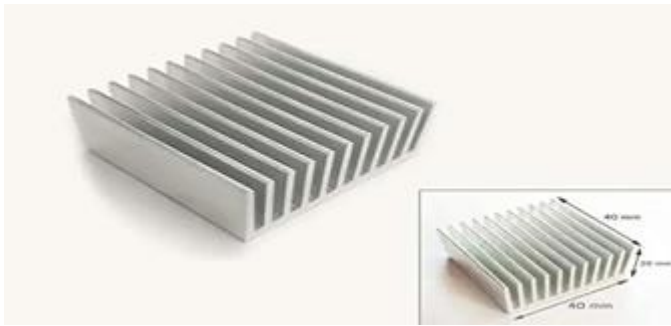
- Hot. Bothside we attach heat sinks and cold surface cools water,

12V D.C Fan



Fan is situated on heat sink on hot side of module to throw hot air in atmosphere.

2. Alluminium Heat sink



heat sink are made up of alluminium placed both side of peltier module for increasing surface area so more air get in contact. Effect increases because of it.

3. 12 volt 12 amp power supply.



This power supply switch works as step down transformer. 150 to 300 Voltage to 12 to 15 voltage.

5. Pump suction valve



Which in the case of valve-controlled (piston) pumps, opens due to the vacuum caused by the reverse pistons

and allows hydraulic fluid to flow through afterwards. In the lower reversal point of the piston, the suction valve is once again pulled shut by a weak spring

6. Lower body casing



Lower body tray which is used to keep fill with water circulate in the cooler.

7. Upper body tray



Upper body tray has fins & D .C. coil attachment which is used to help cooling down the temperature of water to get cool air.

VI. REAL LIFE WORKING APPLICATIONS

We can implement our project anywhere where we can't implement AC. And if your budget is down but you want comfortable like A.C environment.

For e.g.

1. Offices
2. Homes.
3. Laboratory

VII. ADVANTAGE

This technology is pollution free technology.
Very easy
For replacement of equipment.

There is no need of maintenance or we can say it need negligible maintenance.
This circuit is unaffected by external electromagnetic fields.
Hence there is no eddy get created.

[13] McStravick, M et.al 2009, Medical travel pack with cooling System, Patent Application Publication, US Patent Number 49845A1.

VIII. CONCLUSION

It can be concluded from the above information We can also get the experience of A.C within less budget through our project “modified assembled air cooler”. Which is compact in size and portable design. Where in highly effective regions in summer seasons work efficiently. We don’t even have to add ice in water of cooler to get chilled air. So we or human being can feel comfortable and do our work long time more efficiently without getting any fatigue.

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