International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 01 | Jan 2020 www.irjet.net p-ISSN: 2395-0072

Air Conditioning Ceiling fan by using Thermoelectric Module

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Abstract – *Conventional celling fan is most commonly used for human comfort at home/office. But celling fan does not add or remove any thermal effect it has only blade.by using blade it rotate itself by using electric power supply in forward direction and by rotating blade, velocity of air partial present at surrounding increases by using this mechanism comfort achieved. In newly purposed air conditioning celling fan module has addition of thermal effects. Purposed celling fan gives both thermal effect as per requirement. These new invention is thermal enhancement in working of celling fan. Air condition celling fan consist of thermoelectric module which work on D.C supply. Thermoelectric module produce both thermal effect simultaneously due that as per requirement one effect use of working and other effect removed by using heat sink and PCM. Thermal effect is created between celling and blade, effect comes downward by using rotation of celling fan blade. On basis of practical reading of air conditional celling fan compared with conventional celling fan reading 7c to 6c temperature difference achieved within 15 min to 20 min . And by adding moisture control additives we achieve better air conditioning. For this enhancement no any special environmental condition required and hence this invention become dynamic development in celling fan working.*

Key Words: ceiling fan, thermoelectric module, heat sink, thermal comfort, PCM

1. INTRODUCTION

This study is related to the thermal comfort enhancement of ceiling fan by using thermoelectric module. In this invention combination of working of ceiling fan and use of thermal effect produce by thermoelectric module. In Conventional model the ceiling fan or any others fans does not actually cool air, they don't change temperature of surrounding air, they just circulate the air. It does not change the thermal properties. The improvement in the above model is to be carried by using thermoelectric module. The main function of celling fan is to move the surrounding air in forward direction (Upward and Downward) and thermoelectric module is used to provide thermal effect by using electrical DC supply as an input.

Human feels comfort at the temperature range of 18 to 24 degree Celsius, ceiling fans or any other fans do not actually cool air, they don't change temperature of surrounding air, our aim is to achieve a comfortable thermal effect alternatively season to season. Thermoelectric module generate both thermal effect simultaneously hence as our requirement we can use only single effect and other effect can be removed by using the heat sink and phase change material.

Heat sink is a passive heat exchanger that transfers the heat generated by an electronic or mechanical device to a fluid medium fan air or liquid coolant, where it is dissipated away from the device, thereby allowing regulation of devices temperature at optimum level. PCM is a substance with a high heat of fusion which melting and solidifying at a certain temperature. PCM capable of storing and releasing large amount of heat. Their temperature arises as they absorb heat, melting temperature is the temperature at which they change phase from solid to liquid.

Suggested conceptual module of whole entire idea which can more effectively executed by manufacturing organization of ceiling fan.by changing the electric connection and changing current value.so the major improvement is done in the working of ceiling fan in thermal point of view. Hence we conclude that it is the thermal comfort enhancement of working of ceiling fan by using thermoelectric module, heat sink.

1.1 Advantages of the Air conditioning ceiling fan

There are many advantages of the air conditioning ceiling fan over the conventional ceiling fan as below:

i. It improves the thermal comfort as compare to the conventional ceiling fan.
ii. It can also work in all surrounding condition no any special requirement is required for the working.
iii. In the Air conditional ceiling fan there is peltier module is use for the creating the thermal effect so the dry cooling achieve it is main benefits for the using and maintain purpose.
iv. It can easily apply over the conventional ceiling fan no any changes required for the working.
v. It is very simple and easy in construction and mounting in the room.
vi. It has very promising improvement according to the future scope.

1.1.2 Objective of study

The main objective of the invention is to provide a thermal comfort enhancement of ceiling fan by using thermoelectric module. In this device peltier module is mounted on space between ceiling fan and ceiling.

- It eliminates dependency on conventional source like refrigerants used in air conditioning.
- To achieve better cooling with minimum energy losses by using solid state phase change material.
- Objective of experimentation is to make replacement available for conventional air conditioning.
- It utilizes minimum space of the room to adding the thermal effect in the working of the ceiling fan.
- The focus of the objective of experimentation to suggest the new replacement for conventional air conditioning on the basis of various parameters.
- The experimental system work in a various surrounding condition no any special condition is required to the working.

1.2 Design and Material Selection

The purpose of work concentrates on the experimental investigation of which of use of peltier module /effect by using working of ceiling fan for achieving the human comfort more effectively and less in timing. In the CAD designing assembly will construct statically which will be mounted at roof or ceiling of the room. PCM box is designed in circular shape and peltier module are the fitted at the lower side in between the heat sink.

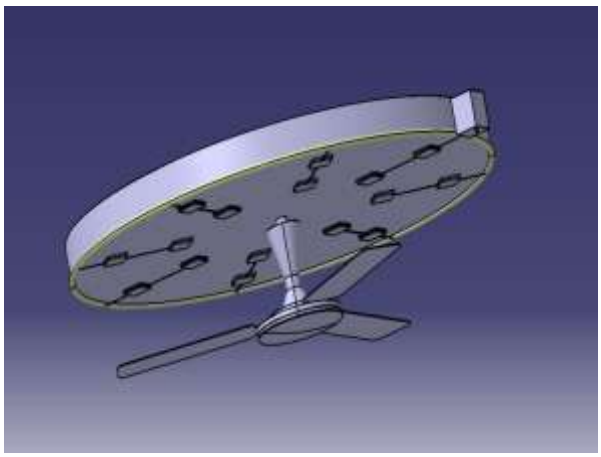

Fig-1: CAD Designing

Table -1: Material and specification

No.	**Material**	**Specification**
1.	**Ceiling fan**	Speed: 330RPM Sweep: 800 Number of blades: 3 Weight: 4.5 kg Input watt: 50/60W Voltage :230 V AC 50Hz
2.	**Thermoelectric Module**	Model No.: TEC1-12706 Rated voltage :12 V Material: Plastic + Ceramics Rated power: 50-72 W Dimension: 12.8*10*4.8cm
3.	**Heat sink**	Material: aluminum Length: 7.5 cm Width: 6 cm Depth: 2 cm

4.	**Paraffin Wax**	Density: 814 (solid), 774(liquid) [kg/m3] Specific heat: 2160 [J/kg. k] Melting point: 45 to 48 ℃ Boiling point: 318℃ Heat of fusion :244 [kJ/kg] Thermal conductivity: 0.15 [W/Mk]
5.	**DC supplier**	Model no: SMPS 3005 Voltage: 30 V Current: 5A

1.2.1. Procedure for the Air conditional ceiling fan setup

Step I - Firstly fit the Phase change box to the wooden shit and simultaneously PCM box must be fill with the paraffin wax. In that there is centralize whole for the ceiling fan fitting so the one extension rod is coming out from the PCM box and the ceiling fan rod is fitted to wooden shit with screw fitting.

Step II – when the fitting of the PCM box will be completed after that the mounting of the thermoelectric module will done over there. The thermoelectric module is fitted in between the two heat sink. In that one heat sink is deep it fitted into the PCM box and another is at the cooling side so it will increase the both the working are of the module.

Step III- while thermoelectric module /peltier module fitting Ana bond thermal conductive heat compound is apply over the module on both the side of the thermoelectric module. Module is required the electric input in the form if electric DC supply.so all module connect in the parallel connection due that current remain constant but the value of voltage is varying.

Step IV – Before the starting the rotation of the ceiling fan it will be must be mounted on the ceiling fan rod which id connected on the PCM and thermoelectric module assembly. And the proper gap rain for the air passing on the heat sink.

Step V- whole assembly must be check the which they fitted in proper way and sequence or not. Before starting the ceiling fan rotation, the peltier module start the working before 15 to 20min. after that the rotation of ceiling fan will started. And then the cooling effect comes downward direction which created by thermoelectric module in the gap of fab blade and the assembly. And the cooling or thermal effect is addition is take place. And also the thermal comfort enhancement is done over there.

Step VI- locate the temperature sensor at the various location for the taking the reading of the temperature. Mount the 8 temperature sensor at different location in the room and take the reading over it.

Fig -2: Experimental Set up

1.3. Observation and Result analysis

T1 – Temperature at the above the ceiling fan at ceiling (℃)

T2- Temperature at the just below the ceiling fan blade. (℃)

T3- temperature at the 1m below from the ceiling fan. (℃)

T4- temperature at the floor. (℃)

T5- temperature at the right corner near to the door side. (℃)

T6- temperature at opposite to the T5at lift corner. (℃)

T7- temperature at the left side wall corner at right side. (℃)

T8- temperature at the left side wall corner at left side (℃).

Tavg- average temperature of the T1 to T8 temperature reading. (℃)

Electric supply for peltier module- 5 amp & 12 volts

Ceiling fan working – 330 rpm, 230 volts AC supply, sweep -800, input Watt for ceiling fan – 50/60watt.

Table-1: Conventional ceiling fan

Time (Hours)	T1 (℃)	T2 (℃)	T3 (℃)	T4 (℃)	T5 (℃)	T6 (℃)	T7 (℃)	T8 (℃)	Tavg (℃)
9	24.2	23.8	24	24.4	25	24.4	24.3	24.8	24.3625
10	26.1	25.6	26	26.2	26.8	26.2	26.4	27	26.2875
11	28.3	27.8	28.3	28.6	29	28.3	28.2	28.6	28.3875
12	31.5	30.7	31.5	31.8	32	31.7	32	32.3	31.6875
13	32.8	31.9	32.4	33	33.4	33	33.1	33.6	32.9
14	33.3	32.4	33.1	33.8	34	33.7	33.8	34	33.5125
15	32.9	32.6	33.3	34.1	34.4	33.9	34	34.3	33.6875
16	32.6	32	32.9	33.2	34.1	33.8	33.9	34.1	33.325
17	32	31.3	32.5	32.9	33.8	33.2	33.3	33.9	32.8625
18	31.4	30.4	31.8	32	32.2	32.8	32.6	33.1	32.0375
19	30.8	29.8	30.7	31.7	31.4	31.9	32.4	32.6	31.4125
20	30.4	29	29.8	31	30.8	31	31.8	31.4	30.65

Table-2: Air conditioning ceiling fan

Time (Hours)	T1 (℃)	T2 (℃)	T3 (℃)	T4 (℃)	T5 (℃)	T6 (℃)	T7 (℃)	T8 (℃)	Tavg (℃)
9	24.2	23.8	24	24.4	25	24.4	24.3	24.8	24.3625
10	25.1	23.2	24.8	25	24.8	24	24.1	24.9	24.4875
11	27.04	25.4	26.1	26.3	26.7	25.6	25.3	26.4	26.105
12	30.2	26.8	29.4	29.6	29.6	28.3	28	28.9	28.85
13	31.2	28	29.8	30	30.8	29.2	29.3	30.4	29.8375
14	32.1	29.1	30	30.3	31.4	29.6	29.4	31.7	30.45
15	31.8	30	30.2	30.5	31.2	29.4	29.5	32.5	30.6375
16	31.3	29.3	29.8	31.2	30.8	28.8	29.2	32.6	30.375
17	30.6	28.7	29	29.8	30	28	29.1	32	29.65
18	29.1	28.1	28.2	28.6	29	27.1	28.7	31	28.725
19	28	27.3	27.8	28	27.6	26.3	27.1	30.1	27.775
20	26.9	26	26.4	27.2	26.9	26	26.7	29.4	26.9375

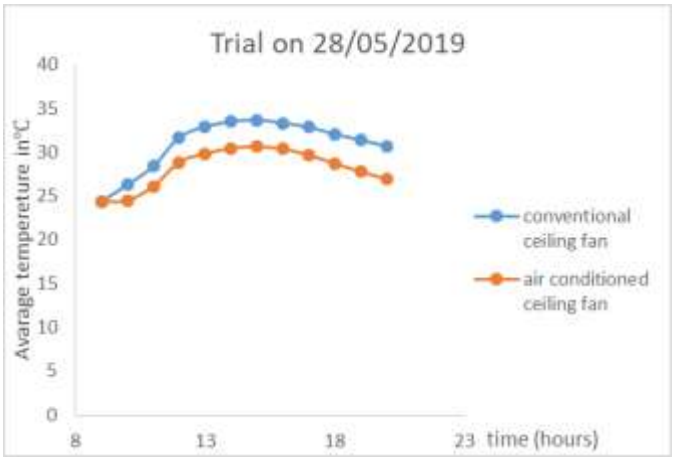

Chart -1: **Time vs average temperature curve**

From the trial observation temperature value and the curve analysis we have to show that the effective thermal comfort is achieve from the working of Air conditional ceiling fan as compare to the conventional ceiling fan and minimum 7℃ to 6℃ temperature difference is achieved between conventional ceiling fan working and air conditioning ceiling fan working.

1.4. CONCLUSION

In this experimentation we have studied all the working background of ceiling fan. From that we found it does not cool air actually it only makes circulation of the air. So that for achieving thermal effect we include the thermoelectric module.

There are several different types of cooling devices available to remove heat from room or to add cooling effect. But as this technology this thermoelectric cooling that can beneficial in handling for small to medium application. The efficiency and effectiveness if thermoelectric cooling stately increases it has benefit that it is available in solid state.

Thermoelectric module eliminates the air conditioning system for chilled water supply. But main problem is that thermoelectric module has two sides one is cold and other is hot simultaneously. To achieve one effect at one time other is become neutralize. For that we are going to use Phase change material. It gives the solution to overcome neutralization of the heating. This concept gives the new solution for effective cooling with minimum losses. Its maintenance also requires less cost.

Overall cost of this setup is low as compare to the other air conditioning system.

With the increasing demand of air conditioning system all over the world this system of air conditioning ceiling fan gives better and perfect replacement for the conventional air conditioning system it also has the better efficiency and lower in the cost.

ACKNOWLEDGEMENT

The author is thankful to prof. A.A. Tamboli (ZCOER, SPPU) and Dr. H.B. Kulkarni (NBN Sinhgad College of Engineering, Solapur) for support and kind help provided during experimentation work.

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