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SOLAR FRIDGE PELTIER MODULE BASED- A Review

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ABSTRACT

The solar-based thermoelectric refrigerator also known as the Peltier refrigerator offers several advantages over conventional systems. It consists of solid-state devices, with no mobile parts, which makes the system dependable, and less noisy. In pas time there is no use of ozone-depleting chlorofluorocarbons, which have an inadequate effect on the environment., environmental damage caused by humans is goes on tremendous level which is all time high of CO_2 and CO emissions, which is eventually causes to the ozone layer depletion, To overcome such Scenarios we have to transfer our surrounding much eco-friendly as our project uses solar energy as input for working of it and we have not used of any harmful refrigerant pure eco-friendly products used

Keywords: Solar Energy, Peltier Module, Refrigeration

1. INTRODUCTION

From the ancient age man always prefers to have cold water for drinking purpose. Also in India, our country the weather is too hot. Normally in summer season, the average temperature of water is 35 to37 ^{0} C. The water is not suitable for drinking purpose. The suitable temperature is at the most 24 to 26 ^{0}C. Hence lowering down of the temperature is an essential task. So we here provide such a temperature in our project without using any pressure compression or vapour compression cycle used solar energy instead. This study will help to the upcoming new idea regarding eco friendly products specially in Heating ventilation and air conditioning department.

OBJECTIVE

1. Developing a thermoelectric cooling system by using solar energy.
2. To enhance the thermoelectric cooler coefficient of performance.
3. To use the solar-based refrigerator as an alternative to using the compressor.
4. To achieve a higher coefficient of performance.

2. LITERATURE SURVEY

In this TEC refrigeration system all mechanical and moving parts are replaced by thermo-electric modules.

Kshitij Rokde, Mitali Patle , Tushar Kalamdar, Radha Gulhane , Rahul Hiware [01] has work on thermoelectric refrigeration system running on solar energy and development of mathematical formulae and their study showed about Mathematical and theoretical characteristics of thermoelectric module the experimental capacity of refrigerator using two peltier plate and heat sink module beside the platier plate to element the maximum number of heat from hot side of plate as per analysis result decreased the temperature is up to 14 °C temperature for 7 hours.

Hazim Moriaa,, Munner Ahmeda, Ashraf Alghanmia, Taib Iskandar Mohamada, Yusli Yaakob[02] has found out in thermoelectric refrigeration system that is The lowest temperature reached to 10.6°C for the cooling while the most temperature was getting at 65°C for heating. Using solar based refrigerator instead of using compressor operated refrigerator has many benefits such as saving the environment, cost, and health. The thermoelectric effect devices used as heat pumps, coolers

Abhijith Raju, Ajeesh J, Akash S, Akhil T J, Vishnu Bose, Jinshah B S [03] they comes to a conclusion that is The result of thermoelectric fridge is shows that the performances were optimum for a given operating conditions. An 15°C temperature reduction at 500 ml water inside refrigeration has been experimentally found with respect to 27°C ambient temperature in 50 minutes. Also the calculated COP of thermoelectric refrigeration cabinet was 0.17. Also it has been experimentally found that the developed thermoelectric refrigeration system can continuously work for 15 hours when battery is fully charged with solar panel.

Uttam Kumar Chaudhary, Adarsh Patel, Deepak Arya, Deepanshu Gautam, Prasoon Choudhary[04] they work on the experiment and concluded, that without the use of Compressor and the Refrigerant It is possible to cool the system. There are several different type sof cooling devices available to remove the heat from industrial enclosures as well as medical enclosures,but as the technology advances,thermo-electric cooling is emerging as a truly viable method that can be advantageous in the handling of certain small-to medium applications.

3. METHODOLOGY

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Thermoelectric refrigerators operate using the Peltier effect (thermoelectric effect). Peltier effect in short is a generation of heat from electrical energy.

A box type refrigerator having dimensions of 30 x 30 x 14 CM which is internally covered with 4mm thick aluminium sheet from all sides having a total capacity of 12.5 liters.

By using the Newtons law of cooling,

$$qc = mCp \times (Tam - Tc)$$

The required power for running the system that is total 125W and they have used three Thermoelectric modules so each consumes 43W.

Use the same setup and they found by using peltier element the actual required power for the setup

QC/Qmax = 0.16 :: QC = 10 W to 0°C to be cooler.

Qmax = QC /0.16 for the given temperature difference dT = 31°C

10 W /0.16 = 62.5 W. at Imax = 5.8 A and Vmax 15 V

Input/required of current and voltage I=2.436 Amp and V = 6.841 V

That means power required is 16.667W

Have calculated required power consumed by the 10 modules used in the prototype Each module takes a maximum of 2.5 A and 3.8 V.

The power needed to give maximum cooling efficiency 2.5 × 3.8 =9.5W.

Total power =power consumed by the modules+power Consumed by fans = 57+12 =69W.

4. RESULTS AND DISCUSSION

- From above data we found that the cooling temperature is average and not better as compare to the classic vapour compressor refrigerator.
- To increase the temperature difference we need to improve performance of the system .
- Improve system means we have to add more modules to the system and power supply also.
- Can also use the water based cooling of the heat sink.

From the above all data we made a table regarding temperatures and COPs as below,

Sr No.	Maximum Cooling Temperature	COP	Temperature difference
01	14.28 °C	1.80	20.72 °C
02	10.6 °C	1.84	12.6 °C
03	12 °C	1.98	15 °C
04	12 °C	1.65	18 °C

5. CONCLUSION

From this project we can conclude that without the use of Compressor and the Refrigerant It is possible to cool the system. This Solar powered and using thermoelectric modules, gain the main advantage of eco friendly refrigerator these are way more cost friendly also and coming in the compact sizes with no any use of compressor and hazardous chemicals and gases. We can improve efficiency by increasing in no. Of modules. These can be used for medical purpose and many. We can also improve efficiency of modules for getting more benefits.

6. REFERENCES

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