

IMPROVEMENT OF EFFICIENCY AND COOLING EFFECT OF PELTIER REFRIGERATOR

Dhruvil patel¹, Kartik patel², Bhavin patel³, Rupanshu parmar⁴, Mayur kachhiya⁵

¹²³⁴⁵Mechanical Department, Ipcowala Institute of Engineering and Technology, Dharmaj, Gujarat, India.

Abstract: The impact of on-going progress in science and technology has created a variety of system that can be used in thermoelectric module for power generation of energy which we further use for cooling effect. The most important utilization of this portable refrigerator is for the preservation of insulin in extreme condition a thermoelectric module (TMC) compressor so that it become portable, as it is based on the principles of peltier effect. The use of peltier effect is to create heating side and a cooling side and also to maintain effectiveness Thermoelectric refrigerator is a solid-state heat pump which uses the components are available commercially. The thermoelectric refrigerator does not produce chlorofluorocarbon (CFC). It is pollutant free-contains no liquids & gases, portable, compact, creates no vibration or noise because of the different the mechanics of the system. It is a prototype and its semiconductor materials, by peltier effect to provide instantaneous cooling. It has the advantage of having no moving parts and thus maintenance free.

Keywords--- peltier effect, peltier plate, thermoelectric module, peltier cooling.

I. INTRODUCTION

Thermoelectric device is one that operates on a circuit that incorporates both thermal and electric effect to convert heat into electricity or electricity into temperature. Thermoelectric model are solid state heat pumps that utilize the peltier effect. During operation, DC current flow through the thermoelectric module, the heat to be transferred from one side to other side of thermoelectric module to create cool and hot side. thermoelectric device can be use as refrigerator on the bases of the peltier effect. To create a thermoelectric or peltier refrigerator, heat is absorbed from a refrigerator space and then rejected to environment. The difference between these two the needed electrical work to be supplied. This type of refrigerator is not popular because they have coefficient of performance.

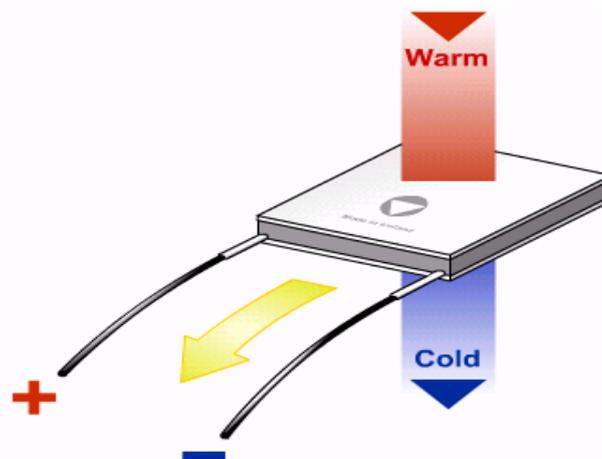


Fig.1 peltier effect

II. LITERATURE REVIEW

- **S. b. riffat (2004):** Recent advances have indicated the possibility of overcoming classical limitations and increasing in the merit of the thermoelectric materials. The investigation is following aspects: tailoring the microstructure of a material to increase phonon scattering in order to decrease thermal conductivity, reducing the dimensionality of the material so that quantum size-effects alter the ratio between the electrical and thermal conductivity.
- **D. Astrain (2005):** In this study we know computational calculation. A computational model has been developed to simulate thermoelectric refrigerators. The accuracy of the model has been experimentally proved in different conditions, providing an acceptable result.
- **Krishpersad Manohar (2014):** The thermoelectric refrigeration took comparatively the same time to cool the water at 6C. The heat transfer process from the water to cold compartment was more efficient than in the freezer of vapor compression refrigerator as the temperature difference with the surroundings was significantly higher for the commercial refrigerator.

- **Dr. j hameed Hussain (2017):** The design of the thermoelectric device comprises four Peltier modules, endowed with a fan. Among all configurations studied, Model simulations suggest that the thermoelectric device must be installed in the wall between the thermoelectric and the freezer compartments, so that the heat generated is given off into the freezer compartment.

III. AIM AND OBJECTIVE

To generate cooling by using peltier effect and maintain cooling by using the thermocoal box and analysis test result.

Objectives:

- To generate the cooling from peltier plate.
- To produce the low pollution.
- Due to low pollution it's environment friendly.
- To easily transferable
- To use at factories, travelling, industries and companies.

IV. FIGURE



V. MATERIAL

In this project we use several materials are used: the peltier plate, heatsink, heatsink with fan and refrigerator is the thermocoal box. And their different properties are air, thermal conductivity, specific heat.

VI. APPLICATION

Generation of cooling by using peltier effect can be used in most of places such as

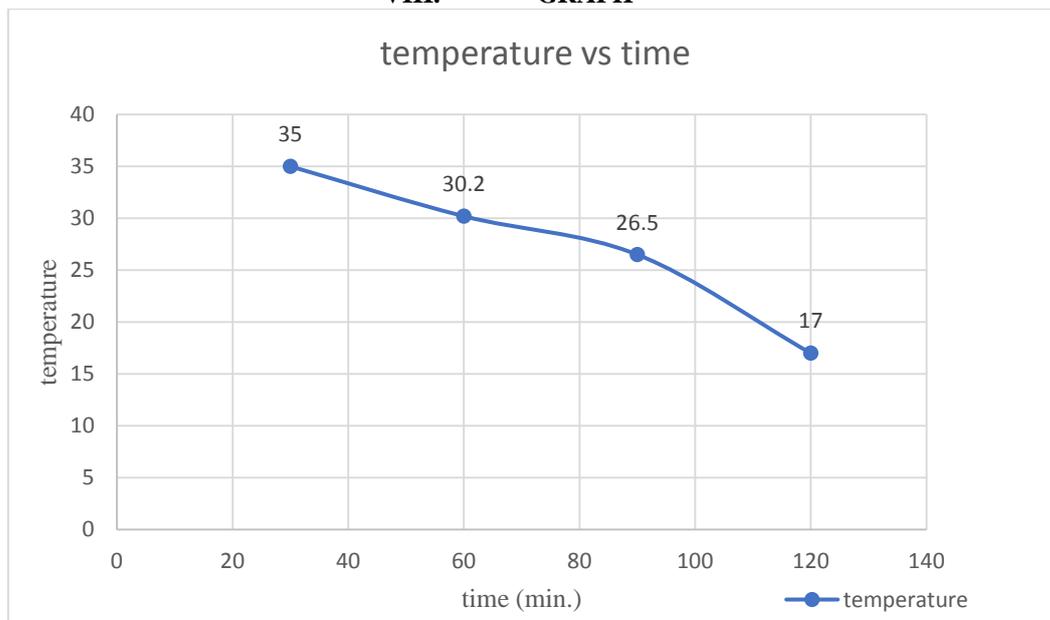
- Factories

- Industries
- Travelling

VII. CALCULATION

Thermocoal box	Dimension(cm)	Time(min.)	Temperature (°C)
A	30cm × 40cm	0min	35 °C
A	30cm × 40cm	30min	30.2 °C
A	30cm × 40cm	60min	26.5 °C
A	30cm × 40cm	120min	17 °C

VIII. GRAPH



- As the cooling of the refrigerator increase the temperature of refrigerator decrease as a compare to time.

IX. CONCLUSION

During construction of the device serval minor changes were made of the design. Each of these changes we changed for easier construction and better performance.

Then the performance of the device is maintaining respect to the project goal. The device get better cooling as we expected.

The device was discovered to have better precision and total heat transfer capabilities while meeting its accuracy requirement.

REFERENCES

JOURNAL PAPERS:

- 1) S. b. Riffat, xiaoli Ma, Improving the coefficient of performance of thermoelectric cooling system: a review, international journal of energy research, Int. j. Energy Res. 2004.
- 2) D. Astrain, j.G. Vian, j. Albizua, Computational model for refrigerators based on peltier effect application, May-2004.
- 3) Krishpersad Manohar, Ademola Anthony Adeyanju, Comparison of the experimental performance of a thermoelectric refrigerator with a vapour compression refrigerator, international journal of technical research and application, Volume 2, issue 3, June-2014.
- 4) Dr.J.Hameed Hussain, G. Anbazhgan, Improve the cop of vapour compression refrigeration system by using thermoelectric cooler, Volume 116, No. 14,2017.

BOOK:

- 1) Refrigeration & air conditioning S.Chand & co.Ltd.