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# AIR-CONDITIONER USING PELTIER MODULES

**Shaikh Sohail Mohiyodin[1], Mubashir Ahmad [2], Mohd Zahid Abbas[3] , Khan Saif Javed Hasan[4]**
*Assistant Prof, Electrical Engineering, EESCOE&T Aurangabad, Maharashtra, India [1]*
*Under Graduate Student[2, 3, 4], Electrical Engineering, EESCOE&T Aurangabad, Maharashtra, India [2, 3, 4]*
*sdafroz@yahoo.com [1], mubashir1992@gmail.com[2],zahed_97@rocketmail.com[3],saifkhan123456789.sk12@gmail.com [4]*

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***Abstract:*** **The present air-conditioning system produces cooling effect by refrigerants like Freon, Ammonia, etc. Using these refrigerants can get maximum output but one of the major disadvantages is harmful gas emission and global warming. These problem can be overcome by using thermoelectric modules (Peltier effect) air-conditioner and their by protecting the environment. The present paper deals with the study of thermoelectric air conditioner using different modules are discussed. Thermoelectric cooling systems have advantages over conventional cooling devices, such as compact in size, light in weight, high reliability, no mechanical moving parts and no working fluid.**

***Keywords:*** *Air conditions, Peltier, Thermocouple*

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## I INTRODUCTION

In thermoelectric materials, electrical energy can be directly converted into thermal energy and thermal energy into electrical energy. Direct conversion between electrical and thermal energy is possible because of two important thermoelectric effects: the Seebeck effect and the Peltier effect. The Seebeck effect refers to the existence of an electric potential across a thermoelectric material subject to a temperature gradient. The Peltier effect refers to the absorption of heat into one end of a thermoelectric material and the release of heat from the opposite end due to a current flow through the material. Thermoelectric cooling, commonly referred to as cooling technology using thermoelectric coolers (TECs), has advantages of high reliability, no mechanical moving parts, compact in size and light in weight, and no working fluid. In addition, it possesses advantage that it can be powered by direct current (DC) electric sources, When a voltage or DC current is applied to two dissimilar conductors, a circuit can be created that allows for continuous heat transport between the conductor's junctions this is the principle of thermoelectric air-condition. Air conditioning is a process of removing heat from a room or other applications. Many ways of producing a cooling effect by like vapour compression and vapour absorption air condition. These air conditioners are producing cooling effect by using refrigerants like Freon and ammonia etc. It gives maximum output but, one of the disadvantage is producing harmful gases to the atmosphere. The harmful gases are cluro fluro carbon and some other gases are present. These types of air conditioners have wide range of applications. An air conditioner is a major home appliance, system, or mechanism designed to change the air temperature and humidity within an area. The cooling is typically done using a simple refrigeration cycle, but sometimes evaporation is used, commonly for comfort cooling in buildings and motor vehicles. Normally we are used in the vapour compression air-condition system ,it has many moving parts and as well as produce harmful gases to the environment.

By using thermoelectric modules air-conditioners we can overcome the existing air-conditioning system by modifying it to protect the environment. A conventional cooling system contains three fundamental parts - the evaporator, compressor and condenser. The evaporator or cold section is the part where the pressurized refrigerant is allowed to expand, boil and evaporate. During this change of state from liquid to gas, energy (heat) is absorbed. At the cold junction, energy (heat) is absorbed by electrons as they pass from a low energy level in the p-type semiconductor element, to a higher energy level in the n-type semiconductor element. The power supply provides the energy to move the electrons through the system. At the hot junction, energy is expelled to a heat sink as electrons move from a high energy level element (n-type) to a lower energy level element (p-type).

## II LITERATURE REVIEW

1. Manoj Kumar presented an experimental study of novel potential green refrigeration and air-conditioning technology. They are analyzing the cause and effect of an existing air-conditions system. Thermoelectric cooling provides a promising alternative R&AC technology due to their distinct advantages. The available literature shows that thermoelectric cooling systems are generally only around 5–15% as efficient compared to 40–60% achieved by the conventional compression cooling system.

2. Shen, Xiao investigated a novel thermoelectric radiant air-conditioning system (TE-RAC). The system employs thermoelectric modules as radiant panels for indoor cooling, as well as for space heating by easily reversing the input current. Based on the analysis of a commercial thermoelectric module they have obtained a maximum cooling COP (coefficient of performance) of 1.77 when applying an electric current of 1.2 A and maintaining cold side temperature at 20°C.

3. Manoj and Walke10conducted an experimental study of thermoelectric air cooling for cars. They are trying to overcome these demerits by replacing the existing HVAC system with newly emerging thermoelectric couple or cooler which works on Peltier and Seebeck effect.

4. Yadav and Mehta11 presented combined experimental and theoretical study of thermoelectric materials and application. The present study develops an optimization design method for thermoelectric refrigerator. This device is fabricated by combining the standard n- and p-channel solid-state thermoelectric cooler with a two-element device inserted into each of the two channels to eliminate the solid-state thermal conductivity.

5. Maneewan conducted an experimental investigation of thermal comfort study of compact thermoelectric air conditioner. In this paper analyses the cooling performance of compact thermoelectric air-conditioner. TEC1-12708 type thermoelectric modules used for heating and cooling application. The compact TE air conditioners COP (coefficient of performance) was calculated to its optimum parameters. Then analyses the COP (coefficient of performance) with respect to time and calculated cop at various considerations.

## PROPOSED WORK

The aim of the project is to investigate experimentally the COP of the thermo electric air conditioner using Peltier Modules. The details of the experimental set up are as in the table 1 below.

The Parameter varied during the Experimentation is Voltage and Current. The temperatures at various locations of the Modules are measured with the help of calibrated thermometer or thermocouples. Heat side can be cooled by applying heat sink and Fan arrangement to maintain the temperature of the Peltier module, by applying the aluminum block on the cold side of the Peltier cool air can be obtained by applying a blower or fan on it.by this method both sides temperature can be maintained easy and thermal runway can be avoided.

***Table 1: Ratings of Equipment's***

| Sr .No | Descriptions | Range/Dimension |
|---|---|---|
| 1 | Peltier Module | 40×40×40 mm |
| 2 | Aluminum Block | 320×6.5×3.8 cm |
| 3 | Rectangular Fin | 68×35 cm |
| 4 | Fiber Sheet or Plastic sheet | 470×36 cm |
| 5 | Thermometer | -100 to10000c |
| 6 | Multi meter | |
| 7 | DC power Supply or Battery | 12 to 14 volt DC |

## III CONCLUSION

The literature regarding the investigation of thermoelectric air conditioner using different modules has been thoroughly reviewed. From the review of the pertinent literature presented above, it can be inferred that thermoelectric technology using different modules used for cooling as well as heating application has considerable attention. Many researchers try to improve the COP (coefficient of performance) of the thermoelectric air-conditioner using different material. Thermoelectric coolers to be practical and competitive with more traditional forms of technology, the thermoelectric devices must reach a comparable level of efficiency at converting between thermal and electric energy.

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