

Eco-Friendly CFC-Less Refrigerating/Air Conditioning System

M. Karthikeyan, Dharma Vignesh P, Kishor A

Abstract: Normally, We are using refrigerating system to store the foods, Medicines..etc to extend the lives of the products. But in the existing refrigerating system which causes cooling effect with the help of refrigerants like CFC's,HCFC's. They are the harmful components which causes environmental Degradation. In order to overcome this we are using peltier concepts for refrigeration and protecting the environment. In this project to introduce a portable refrigeration using peltier Element. In peltier element when given DC supply produces cooling effect on one closed surface and heating effect on another surface. The cooling effect on one surface is circulated using a fan. The heat from the hotter side is sink in the heat exchanger is removed using circulating coolant or using fan. A 230V AC supply is step down using a Transformer and Rectified using a Bridge rectifier and given as a Input to the Buck converter. The Buck Converter supplies variable DC supply to the Thermo Electric Generator. The main advantage of this system is eco friendly and simplified system with reliable control.

Keywords: Peltier element, Portable refrigerating system, Buck Converter

I. INTRODUCTION

In today's modern world the major problem is increase of power consumption because of that demand of power also increases power consumption. But for that semiconductor material is a better solution. In order to avoid Refrigerants the Peltier module is one of the better solution and also completely free from some of the important environmental problem like pollution. Ozone layer depletion is available. The main aim is to introduce the portable refrigerating unit using peltier module with help of DC supply. The DC supply is provided with the help of Buck Converter to vary the temperature by adjusting it Voltage. This will overcomes the disadvantages of conventional refrigerating system and for the increase in population and environment pollution there is an alarming rate for thermoelectric couple system these products are affordable and compact in size [1-4].

II. LITERATURE REVIEW

Maneewan et al directs an exploratory examination of smaller thermoelectrically air conditioning and its cooling system [5, 6]. They analyzed about the cooling execution of portable thermo electric air conditioning system. TEC1-12708 type peltier module was utilized for warming and cooling application. The portable thermo electrical air

conditioner unit and heating and cooling systems Coefficient of Performance was computed and it is a ideal parameters. At that point they investigate about the Coefficient of performance regarding time and computed Coefficient of Performance at different considerations [7-10].

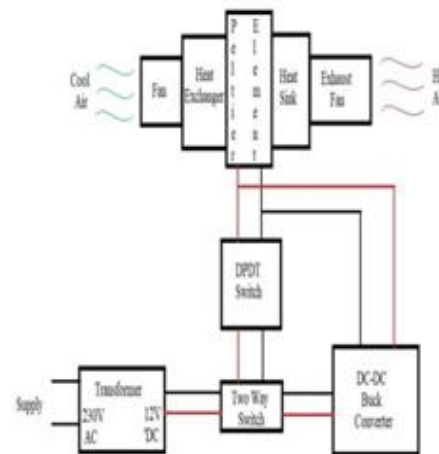


Fig.1. Structure of thermo electrical air conditioner

III. EXISTING SYSTEM

A. Eco-Friendly Refrigerator Using Peltier Device

Now-a-days inventions are growing vastly particularly in the area of home appliances such as air conditioner and refrigerators. But in the existing refrigerators they use a refrigerants for cooling purpose. The refrigerants which are harmful components which causes environmental degradation. In order to protect the environment from refrigerants they use a peltier module in that they will produce a cooling effect but they use a microcontroller application for their system in order to vary the temperature. With that microcontroller they will change the temperature. In that the Peltier module to act as cooling element for reducing the heat at the surrounding area. This System which overcomes the effect of environmental Degradation. This System can be better for use in remote village areas where there is unavailability of power. In this System they used Solar power as power source which overcomes the effect of environmental Degradation. It requires semiconductors to replace existing system for reducing power consumption for cooling system. The temperature sensors are used to maintain the required temperature and to avoid the freezing point. This is achieved by cutting down the power supply to the peltier module.

Revised Manuscript Received on May 06, 2020.

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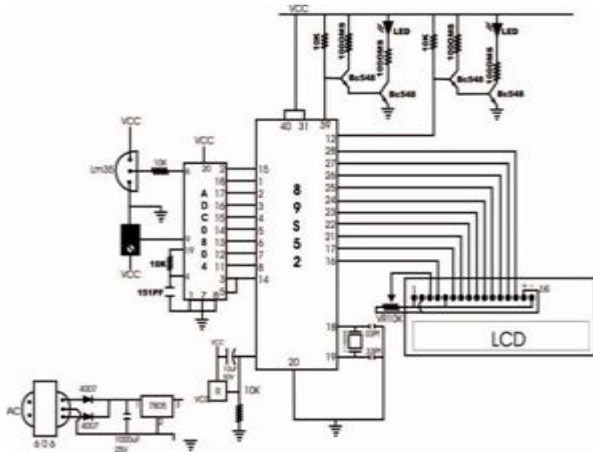


Fig.2. Circuit diagram of Eco-Friendly Refrigerator Using Peltier Device

IV. PROPOSED SYSTEM

In the proposed system the peltier element plays a major role by providing cooling effect as well as warming effect. In this project we are using a converter to convert the 230V Ac to 12V Dc. In that we are using a Two way switch to make a choice of whether the power will go to buck converter or to the DPDT switch. In that DPDT switch it have a six pins by using the DPDT switch we can switch over from warmer as well as a cooler. From this we are giving 12V supply to the Peltier module. When Dc supply given to peltier element it give hot effect on one surface and cooling effect on another surface. The hot effect on one side can be absorbed by using the heat sink and evacuate the heat to the surrounding with the help of exhaust fan or by using a coolant. The cooling effect on one side can be circulated by using fans to the closed surface. By interchanging the polarity of the power supply we can switchover from cooler to warmer without any additional circuit.

Table I: Load Calculation

Load	Current	Voltage
Peltier	6A	12V
Circuitries	2A	12V

V. EXPERIMENT AND RESULTS

This project is able to reduce the temperature from 34 to 12 and any temperature in the range of 17 to 34 can be achieved by adjusting the potentiometer in the buck converter. The cooling effect of this project is directly proportional to the input voltage and by using the potentiometer in the buck converter the switching frequency of the buck converter is adjusted to get the output voltage in the range of 0 to 12V. When the output voltage of the buck converter is changed the output temperature then the output of the project will change. Constant output temperature is achieved. The peltier element by giving 12V supply they get cooling effect as well as warming effect. In that project develops a cooler as well as warmer by simply interchanging the polarity of its power supply. Through this project develops a portable Refrigerating/Air conditioning system in that which is Eco friendly and completely free from CFC's in that we are using buck converter to vary the temperature

instead of using with microcontroller to vary a temperature. This proposed system is simple and economical which is completely free from environmental degradation. These kind of refrigerating system which can also be employed in medical purpose for storing medicines at different temperatures. By employing these refrigerating systems it can reduce a cost of refrigerating system.

The variation in temperature on heat radiating side and heat absorbing side of peltier module is recorded with respect to time and a graph is plotted.

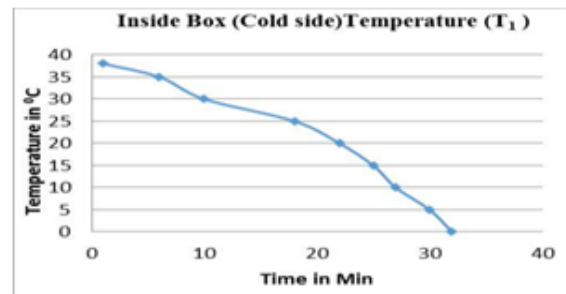


Fig.3. Graph between Temperature vs Time

Table II: Cold Sided Temperature

Cold sided temperature	
Temperature in ⁰ C	Time in min
32	0
30	5
27	10
25	15
22	20
18	25
10	30
6	35
1	38

Table III Ambient Temperature of Air

Ambient temperature of air T ₂	
Temperature in ⁰ C(T ₂)	Time in min
32	0
31.8	5
31.7	10
32	15
32.5	20
33	25
32	30
32.4	35
32.1	38

Each output pin is collected to the base of the transistor which triggers the 4 channel Relay module to switch on or switch off the load connected to it.

VI. HARDWARE DESCRIPTION BUCK CONVERTER

The buck converter is one of the type of DC- DC converter that efficiently converts a high voltage to a low voltage. Efficient power conversion which extends the battery life, reduces heat, and

allows for a smaller gadget to be built. The buck converter can be used in lots of applications. By using the buck converter we can vary the temperature by reducing the voltage.



Fig.4. Buck Converter

A. Peltier Module

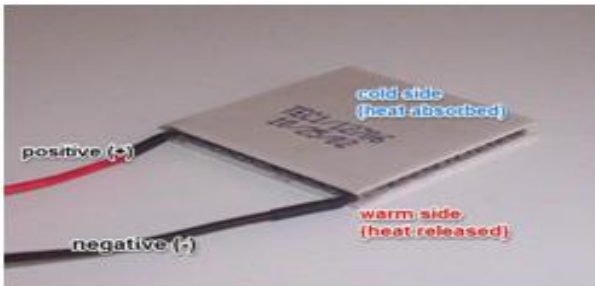


Fig.5. Peltier module

The conversion of temperature differences to voltage is known as Seebeck effect. In Seebeck effect two dissimilar metals are connected between the hot and cold junction to produce an Electromotive force. So the electrons are forced to move from hot junction towards cold junction in the n-type semiconductor and vice versa. This movement of electrons and holes made an Electromotive force to flow in the circuit. In the peltier module we can also develop a warmer by interchanging the polarity of the power supply. By using the same setup we can develop cooler as well as warmer.

B. Heat Sink



Fig.6. Heat Sink

Heat sinks which are the heat exchangers which transfers thermal energy from one side of the medium to another side for the purpose of heating and cooling purpose. The heat on that metal will be transferred in the form of fluid within the area. Heat sink which simply absorbs the heat or cold when it is connected with any material.

VII. RESULT

Through this project we developed a portable Refrigerating/Air conditioning system in that which is Eco friendly and completely free from CFC's in that we are using buck converter to vary the temperature instead of using with microcontroller to vary a temperature. This proposed system is simpler and more reliable also cost efficient.

VIII. CONCLUSION

The portable Refrigerating/Air conditioning unit which is developed using the peltier module which is completely free from CFC's By using the peltier module for refrigerating system it provides a efficient cooling. This greatly reduces the cost and make it affordable to people, making it the most efficient product for portable refrigerating system. This refrigerating system which can also be employed in medical purpose for storing different medicines at different temperature. By employing this refrigerating system it can reduce a cost of refrigerating system. From this perception we able to conclude that it is simple economical and eco friendly refrigerating/Air conditioning system.

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