# Retrieving Energy Using Peltier Effect

Vibhav Sharma
Department of E.C.E.
Bharath University,Chennai-73,India
Email:Vibhav_24@hotmail.com

Priyam Ganguly
Department of E.C.E.
Bharath University,Chennai-73,India
Email:Priyamganguly0@gmail.com

Syed Md. Taqiudeen
Department of E.C.E.
Bharath University,Chennai,India
Email:akram.duke@hotmail.com

B.karthik
Department of E.C.E.
Bharath University,Chennai,India
Email:karthiklect@gmail.com

*Abstract*—**In this project we are utilizing temperature difference between two bodies to produce voltage by using peltier effect.The power produced by the temperature variation will be stored in a capacitor acting as a battery and when required the this power can be used for communication and other purposes.It is a renewable source of energy and hassle free power generation**..

***Keywords***— *peltier effect, temperature variation ,seeback effect, renewable energy*

I.

## 1.INTRODUCTION

French physicist Jean Charles Athanase Peltier (1785–1845) discovered peltier effect in1834. He found that a voltage existed between two ends of a metal bar when a temperature gradient existed within the bar. A temperature difference causes diffusion of electrons from the hot side to the cold side of a conductor. The electrons mobility creates an electrical current. Peltier found that the junctions of dissimilar metals either very heated or very cooled, depending upon the direction in which an electrical current passed through them.

## 2.EXISTING SYSTEM

The conventional renewable energy that are exist such as wind energy,solar energy has certain limitation .In solar power generation it requires broad daylight which is not available every time so it cannot produce energy all the time.As in wind power generation it requires minimum wind speed to harvest energy appreciably .Apart from all these disadvantages another thing which makes above mention techniques less

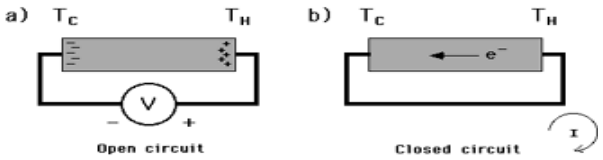
popular is the price .The equipments are very expensive and requires more free space.Another technique which can produce electricity irrespective of environment condition is piezo electric effect .where voltage is produced by using vibration of the crystals .But its main drawback is that voltage output is extremely low and continuous vibrations are required.

## 3.PROPOSED SYSTEM

In this project a versatile power source will be developed using which many applications will be possible.Using the human body heat as one source of temperature and the surrounding climate as another source of temperature, we can generate power using the peltier effect.This is also better than other sources like peizo electricity where is a person has to walk to produce power.This system can be used by anyone and everyone using human body heat.Low cost compared to solar and lifelong power source that does not involve any recurring cost or replacement.By using the temperature variation we can produce voltage that can be used for various purposes such as emergency cell phone charger,emergency LED light etc.This system is very useful in cold areas where temperature is extremely cold .In this system peltier module is tailored in the jacket itself so that using human heat as one source and extreme cold environment as another we can produce voltage without doing any physical work.It can be made as a part of the uniform of a solider thereby producing power continuously for the whole day and the same can be used when needed.It can also be used for any civilian uses also.

## 4.PRELIMINARIES

The physical phenomenon of thermoelectricity is mainly based on the Seebeck and Peltier effects
which states that the conversion of thermal energy into electrical energy and vice versa respectively. In 1821, Thomas Seebeck discovered that an electric current would flow continuously in a closed circuit made up of two different metals, if the junctions of the metals were maintained at two different temperatures




$S = dV / dT;$

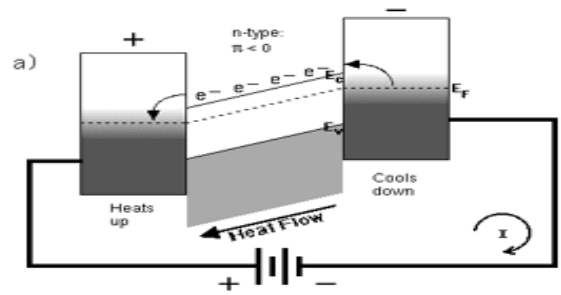
Here,S is the Seebeck Coefficient with units of Volts/ Kelvin

And S is positive when the direction of electric current is same as the direction of thermal current

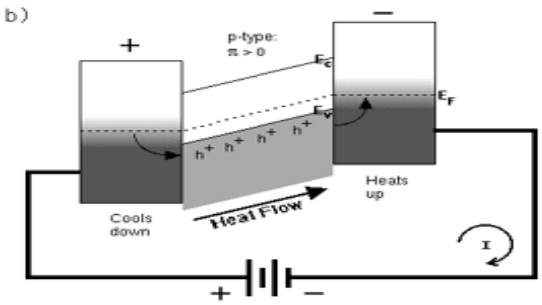
A temperature Variation causes diffusion of electrons from the high temperature side side to the lower temperature side temperature of a conductor.

The flow of electrons creates an electricity.
The voltage which is produced is proportional to the temperature variation as given by: $V=\alpha(Th-Tc)$

In the year of 1834, a French watchmaker and part time physicist, Jean Peltier discovered that an electrical current would produce a temperature gradient at the junction of two different metals.Peltier found that the junctions of different metals were either very heated or extremely cooled, depending upon the direction in which an electrical current passed through them.
Heat generated by current flowing in direction was absorbed if the current was reversed.The Peltier effect is found to be proportional to the first power of the current, not to its square, because it is irreversible generation of heat caused by resistance throughout the circuit.

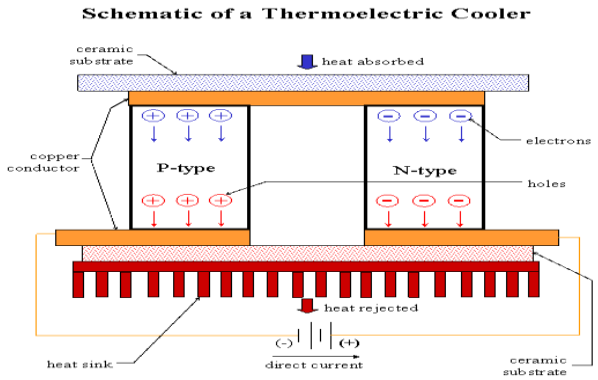



Π <0 ; Negative Peltier coefficient
High energy electrons move from rightside to leftside
Thermal current and electric current travels in opposite directions.




Π >0 ; Positive Peltier coefficient
High energy holes move from leftside to rightside
Thermal current and electric current travels in same direction.

In 1954, H. J. Goldsmid discovered that n-type and p-type semiconductors show better the Peltier effect compared to different metal junctions and Bi-Te alloys worked better to serve the purpose At the junction of two different metals the energy level of conducting electrons is forced to increase or decrease. A decrease in the energy level emits heat energy, while an increase will absorb heat energy from its surroundings.The temperature gradient for different metals is very small.

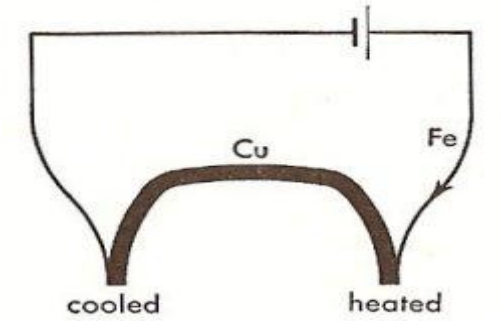



Bismuth-Telluride n and p stops an electric current compels electrons in n type and holes in p type far from each other on the cooler side and towards each other on the hotter side.

The holes and electrons pull heat energy from where they are heading far from each other and deliver it to where they meet.

## 5.Result And Calculations

Whenever an electric current travels through a conductor, the terminals of which are maintained at different temperatures, thermal energy is evolved at a rate approximately proportional to the product of the current and the temperature gradient




In the above circuit,we can see that the right-hand junction is heated,it shows that electrical energy is converted into heat energy. Meanwhile, thermal energy is transformed into electrical energy at the left junction, therefore, causing it to be cold. When the current is reversed, heat is absorbed at the right junction and produced at the left one. Absorption or production of heat at a current-carrying junction is an indication that an electromotive force (emf) is present at the junction. If the direction of the current is the same as that produced by the emf at the junction($\pi$) Each current carrier, $q$, is accelerated as it travels the junction, gains energy

$W = \pi q$. (1)

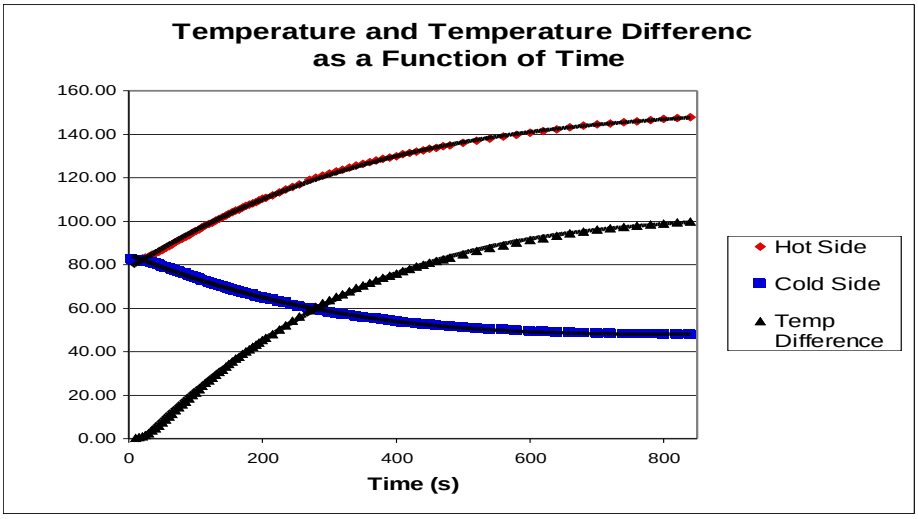
This thermal energy have to be absorbed from the surroundings, by which the junction is cooled. When the above circuit is interpreted in the light of this argument, it can be seen that at each junction the copper is positive with respect to the iron. The heat absorbed/ second at a junction carrying a current $I$ amperes is give by:

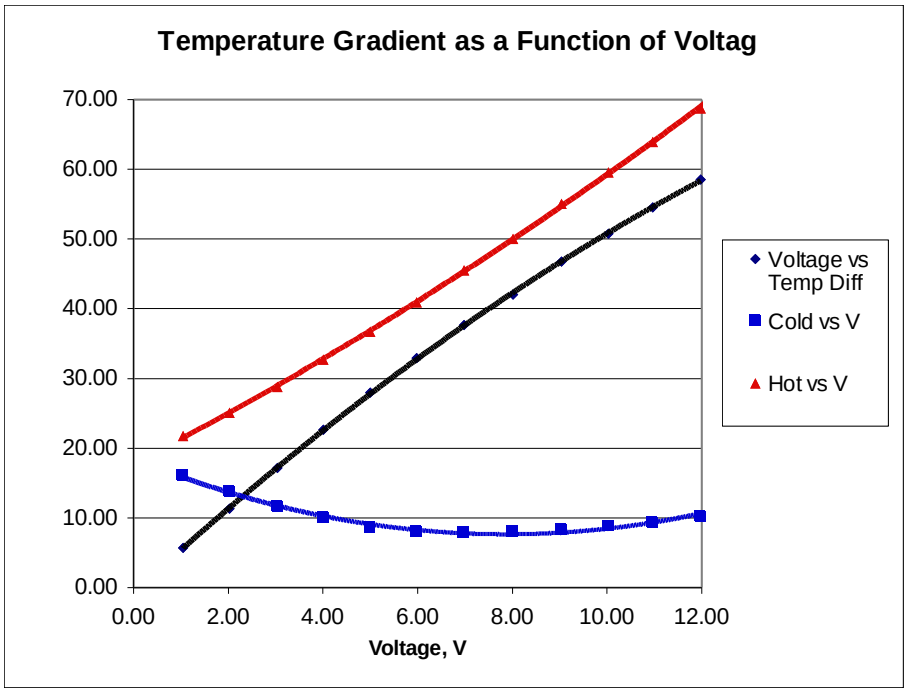
Heat absorbed/sec = $\pi_{ab}I$ (2)

where the current is from metal *a* to metal *b*. At the junction emf, $\pi_{ab}$, is known as the **Peltier coefficient**; it is the thermal energy absorbed /second at the junction /unit current, that is, the heat energy absorbed / unit charge. $\pi_{ab}$ is positive if metal *a* is positive with respect to metal *b* (thus $\pi_{Cu, Fe}$ is positive). The magnitude of$\pi_{ab}$ is a function of the temperature of the junction. For identical temperatures $\pi_{ab} = -\pi_{ba}$. Thus, if the direction of the current in equation (2) is reversed, the heat absorbed /second is given as

Heat absorbed/sec = $\pi_{ba}I$ (3)

which should be, and is, opposite in sign to equation (2). Thermal energy produced at a junction is a combination of Joule heat and "borrowed" heat contributed by connections elsewhere in the circuit0. Heat absorbed by a junction will be "pumped" into the other junctions distributed all over the circuit. Semiconductor materials formulated especially for use in Peltier devices show "heat pumping" efficiency several times that of the most active metal pairings. These devices are used in various applications such as lunch box coolers/warmers to laboratory instruments and communications systems. Quite large temperature Variation can be generated by cascading or pyramiding Peltier devices such that each level in the pyramid acts as a heat sink for the level above.






## 6.CONCLUSION AND FUTURE WORK

This research work proved that n- and p-semiconductors could be used to carry out the Peltier effect. The temperature gradient can be observed as rising while increasing the applied voltage. This kind of temperature difference indicates that the Peltier effect is the dominant process in the higher voltage region. In conclusion, low cost Peltier modules can be fabricated using n- and p-semiconductor thin module.And these modules can be tailored in the uniform of soldiers and can be used by them to produce electricity 24*7.Its a low cost power generation technique. And completely environment friendly.

The future for this technique is very bright.This effect can be used to monitor the real time health situation of a soldier in a battle field.We can place a peltier module in the uniform of the soldier by this we can attach temperature and heart beat sensor and by using rf transmitter it can be monitored by army's base.Further its going to full fill our future energy needs.In this way we can preserve our fossils for future generations.

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**About Authors :**


**B.karthik** is currently working as an assistant H.O.D of Electronis & Communication Department at Bharath University,Chennai

**Priyam Ganguly** is currently pursuing his B.Tech in Electronis & Communication Engineering from Bharath University,Chennai.He is doing his project work in Retriving Energy using Peltier Effect under the expert guidance of Mr. B.Karthik at Bharath University.

**Syed Md.Taqiudeen** is currently pursuing his B.Tech in Electronis & Communication Engineering from Bharath University,Chennai.He is doing his project work in Retriving Energy using Peltier Effect under the expert guidance of Mr.

B.Karthik at Bharath University.

**Vibhav Sharma** is currently pursuing his B.Tech in Electronis & Communication Engineering from Bharath University,Chennai.He is doing his project work in Retriving Energy using Peltier Effect under the expert guidance of Mr. B.Karthik at Bharath University.