



INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X

Impact factor: 4.295

(Volume 5, Issue 6)

Available online at: www.ijariit.com

Design and fabrication of body heat balance jacket

Rohit Nandan

rnandan252@gmail.com

Pranveer Singh Institute of Technology, Kanpur,
Uttar Pradesh

Shivam Dixit

shivamdixit09559@gmail.com

Pranveer Singh Institute of Technology, Kanpur
Uttar Pradesh

Akhilakh Ahmad

akhilakh.ahmad.7@gmail.com

Pranveer Singh Institute of Technology, Kanpur
Uttar Pradesh

Sarvesh Kumar Vishwakarma

sarveshsanu0@gmail.com

Pranveer Singh Institute of Technology, Kanpur
Uttar Pradesh

ABSTRACT

The objective of proposing this topic as a project is the well-being of the human being. And out of the various factors affecting; Temperature is one out of them which is irresistible when we are talking of human comfort whether it is summer, winter or rainy. A stable core body temperature is essential for proper and optimal function so for maximum efficiency of body temperature needs to be within limits.

Keywords— Heat-jacket, Heat balance, Metabolic, Comfort, Peltier module

1. INTRODUCTION

The human body has a specific core temperature range necessary for an individual to maintain peak performance capabilities. This core temperature optimization and control are vital strenuous situation in which optimal human performance is necessary. A stable core body temperature is essential for proper and optimal function, in extreme hot and stress full environments this can often be difficult for individuals without proper cooling mechanisms. The previous works on this proposed topic are limited to only one function, they are capable of performing only one function i.e. either only heating or cooling. It is not possible to perform both functions in earlier versions. In earlier models were of storage type only i.e. directly hot water or cold water is filled in a leak proof bag and applied for the concerned function. Then further modifications include use arrangement of pipes along with the use of hot or cold water then further use of the electric circuits for controlling operations and then use of Peltier module is inculcated to achieved desired function.

2. LITERATURE REVIEW

In this paper the emphasis was on the designing of a stretchable textile heat exchanger jacket which wraps about and conforms to a limb, an arm or other body member and functions therapeutically to heat or cool the member. The jacket is formed by a sheet of elastic fabric material having threaded therein an array of flexible plastic pipes whose respective ends are coupled

to an inlet fluid distributor and an outlet fluid collector. Fluid at a controlled temperature from a pressurized fluid source is fed into the inlet distributor, the fluid from the outlet collector being returned to the source for recirculation through the pipes. [1]

This paper examines and presents the working of solar refrigerator based on thermo electric cooling and Peltier effect. Like other countries of GCC, the UAE realizes that it has to rely less on oil and gas and start to consider other sources of energy for power production. Solar energy has been one of the most important renewable resources of energy that has been lately used for generating electricity. But amount of electricity generated from these solar panel systems is not enough for efficiently controlling a device. The main principle of the solar refrigerator is to produce a positive and negative temperature effects on its either junctions by supplying an electrical voltage with extra heat available on the plate through solar heat to generate a cooling effect. Thermoelectric cooling systems have advantages over conventional cooling devices, such as compact in size, light in weight, high reliability, and no mechanical moving parts. [2]

In this journal the emphasis is on development of a heat exchanger cum jacket for application in the field of military and medical science there are refrigerators used to cool samples or specimens for preservation. They include refrigeration units for storing blood plasma and other blood products, as well as vaccines and other medical or pharmaceutical supplies. They differ from standard refrigerators used in homes or restaurant because they need to be very hygienic and completely reliable. However, in case of transportation of component from one place to another place there is no refrigeration system. Due to such problem, portable refrigeration system is to be used. Thermoelectric refrigeration is new alternative because it can convert waste electricity into useful cooling, is expected to play an important role in meeting today fossil energy challenges. Therefore, thermoelectric refrigeration is greatly needed, particularly for developing countries where long life and low maintenance are needed. [3]

2.1 Conclusions drawn from Literature Review

From proper study of articles presented in literature review it is being concluded that –

- The previous works in this field are capable of providing heating and cooling but not both and also the effectiveness drawn is not very much capable of providing the desired effect.
- Also the thermoelectric devices can be efficiently used for attaining desired level of effectiveness subjected to constraints like application, required temperature drop, maximum temperature rise, power consumption etc.
- To propose a model capable of both heating and cooling Peltier modules can be used which are working on the reverse effect of seeback effect. And by proper design constraints much higher effectiveness can be achieved and can be of much use for various listed beneficiaries.

3. GAP OBSERVED

- Earlier models are not capable of heating and cooling both; only one operation can be performed.
- Previous work (ref. [1]) uses heater for heating or uses cold water for cooling
- Earlier models are not capable of regulating the fluid temperature.
- Subjected to mechanical vibrations due to moving parts.
- Conventional systems can use or generate harmful gasses like Chloro Fluoro Carbons (CFCs) and Hydro Chlorofluorocarbons (HCFCs). The Peltier module can't use or generate these harmful gasses.
- Very noisy operation of the cooling fans.
- Operating of these devices requires AC source.

4. PROPOSED METHODOLOGY

The basic working principle in the system is the Peltier effect which produces both heating and cooling effect. The Peltier effect states that when a voltage is applied between two electrodes connected to a sample of semiconductor material a temperature difference is created. If the heat needs to be transferred from one medium to another on a small scale, this phenomenon can be used. To create a heat flux between the junctions of two different types of materials, Peltier effect is used. Peltier cooler, heater, or thermoelectric heat pump is a solid-state active heat pump which depends on the direction of the current and transfers heat from one side to the other side of the device, with consumption of electrical energy.

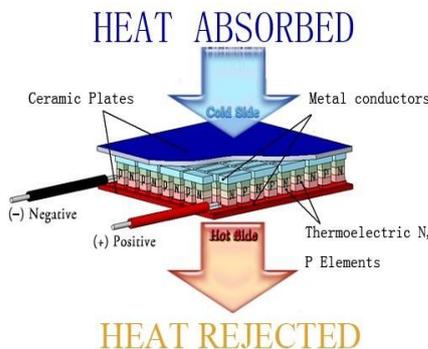


Fig. 1: Peltier effect

The major application is cooling, but it can be either used for heating or cooling. It either heats or cools, and hence can be used as a temperature controller. A temperature sensor (LM335) is used to sense the body temperature. The LM335 is a temperature sensor that can be used to measure the temperature and produces an electric output proportional to the temperature. It gives an output voltage proportional to temperature in degree Celsius.

This jacket primarily consists of Peltier modules, pump, battery, copper tubes, temperature sensor, and control circuitry. The intended function of heating as well as cooling is achieved by the application of Peltier module which is working on the principle of Peltier effect. The circulation of water is done with the help of pump inside of copper tube which runs throughout the jacket. Here water is used as working fluid to accommodate for the exchange of heat between body and the copper tubes.

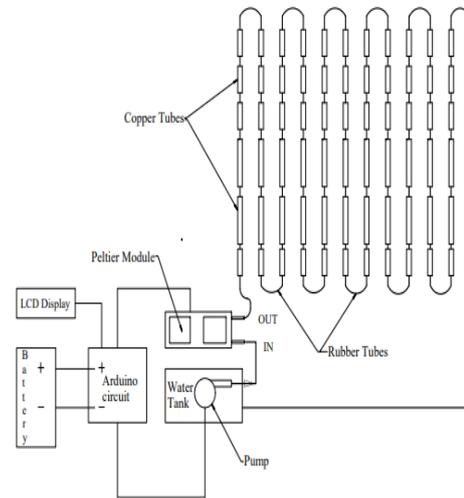


Fig. 2: Schematic diagram of the layout of the project

A peltier plate is made up of a junction between two metals. Metal on one side heats up and on the other side it cools down, when an electric current flows through the junction. Extreme heat which could be produced on one side has to be dissipated out of the body. Here the heat is converted to chemical energy and that particular side of the plate is covered by aluminum mesh which is excellent heat dissipater. Thus the peltier module functions as both heating and cooling system. The supporting flowchart of the circuitary is being presented.

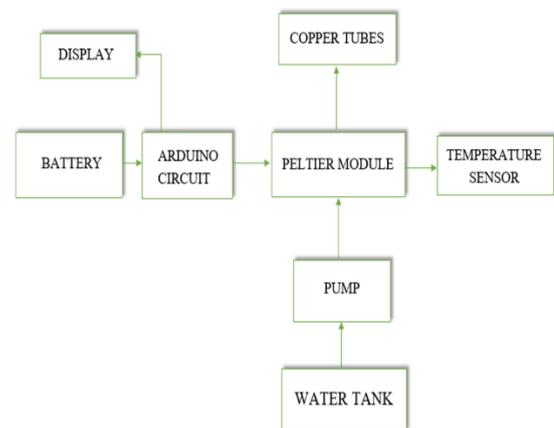


Fig. 3: Flowchart of the Layout

5. CONCLUSION

A heat exchanger jacket to control the temperature of the human body within the human body comforting limits is introduced which is primarily working on the Peltier effect. This jacket allows the user to monitor and control the internal body temperature from higher temperature to lower temperature, depending upon the climate variations.

It definitely protects the people from heat strokes and other health issues caused due to temperature variations. It also acts as a guard for the mountain climbers keeping the body

temperature at a certain level. It creates the comfortability, practicality and mobility for the user within small proximity. Thus the climate controlled jacket monitors and controls the extreme temperatures, and provides an optimum, moderate temperature to the people who wear it by using Peltier module.

6. REFERENCES

- [1] Kuznetz; Lawrence, "stretchable heat exchanger jacket", 1985 ,US4523594A retrieved from url <https://patents.google.com/patent/US4523594A/en>
- [2] Karan Viraj Singh, Dr. Kavita Jerath Thermoelectric Cooler International Journal of Mechanical and Industrial Technology ISSN 2348-7593 (Online) Vol. 4, Issue 1, pp: (78-84), Month: April 2016 - September 2016
- [3] Patil, R. P., Prof., Suryawanshi, P., Pawar, A., & Pawar, A. (2017). Thermoelectric Refrigeration Using Peltier Effect. International Journal of Engineering Sciences & Research Technology, 6(5), 614-618. doi:10.5281/zenodo.800636
- [4] Manoj Kumar Rawat, Himadri Chattopadhyay, Subhasis Neogi , "A review on developments of thermoelectric Refrigeration and air conditioning systems: a novel Potential green refrigeration and air conditioning technology" International Journal of Emerging Technology and Advanced Engineering Volume 3, Special Issue 3: ICERTSD 2013, Feb 2013, pages 362-367
- [5] Wei He, Gan Zhang, Xingxing Zhang, Jie Ji, Guiqiang Li, Xudong Zhao "Recent development and application of thermoelectric generator and cooler" in Elsevier Journal of Applied Energy volume 143 (2015) pages 1–25.