



IJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 12 **Issue:** IX **Month of publication:** September 2024

DOI: <https://doi.org/10.22214/ijraset.2024.64247>

www.ijraset.com

Call:  08813907089

E-mail ID: ijraset@gmail.com

Compact Solar Generator with Increased Efficiency

Shivansh Singh

Student, Department of Electrical And Electronics Engineering, Shri Ram Murti Smarak College Of Engineering And Technology, Bhojipura, Bareilly, Uttar Pradesh, India

Abstract: Today the world is moving towards renewable energy. Most important and common form of renewable energy is solar energy. But solar panels have less efficiency and covers more space. This paper discusses about new way of generating electricity with the help of solar panel. A small scale experiment was conducted results have proven good performance. In future this concept will prove a golden change in the life of people.

I. INTRODUCTION

A solar panel is a device which converts sunlight into electricity. They work on photovoltaic effect and are made up of crystalline silicon cells which is responsible for excitation of electrons. These electrons flow into circuit and produces DC current.

II. PRINCIPLE BEHIND SOLAR PANEL

When sunlight falls on the solar cells, they absorbs energy and create electrical charges. Panels are made from generally Silicon which is semiconductor material. They absorbs photons and dislodge electrons from semiconductor material. So the electric field is generated and move the electrons to the N type layer and protons to the P type layer. When these layers are connected by wire, the electrons flow from N type to the P type layer creating an electric current.

III. OVERVIEW

Solar generator works on the same principle but in some different way. The modules used here generates electricity when there is temperature difference between two sides. These modules known as peltier modules. When difference is created they generates electricity.

IV. LITERATURE

Our project is based on the combination of solar panel and seebeck effect of peltier modules. We combine 10 peltier modules and fixed them in frame. The hot side of module is exposed to sun and cold side is facing downwards. We provide cooling effect in the cold side. We have done the experiments outputs are very effective.

Since innovation is necessary to bring the change in this world to make the life more comfortable for the present and for upcoming generation so our project is also based upon the needs of people in the entire world by making it compact, needs less space and generates more electricity and will be easily available for all the peoples.

V. APPLICATIONS

Now a days many home, shops, departments, public places have solar panels installed but they are not upto the capacity because if they do so they require large space for installation. Our project can be used in both ways that is whether it is n grid system or off grid system.

Our model and arrangements can be installed on any kind of roofs. Following are some advantages-

- 1) Installed in less space .
- 2) Having more output in small size.
- 3) Very low in fact zero maintenance after installation.

VI. SYSTEM DESCRIPTION

In our project we have installed peltier modules which are sandwiched between two hollow thin boxes opened from one side only. All peltier are fixed from thermal paste so that heat can be transferred easily.

All the peltier are of 12706 rating. We fixed them and all the wires are hanging outside into air as shown in fig.1.

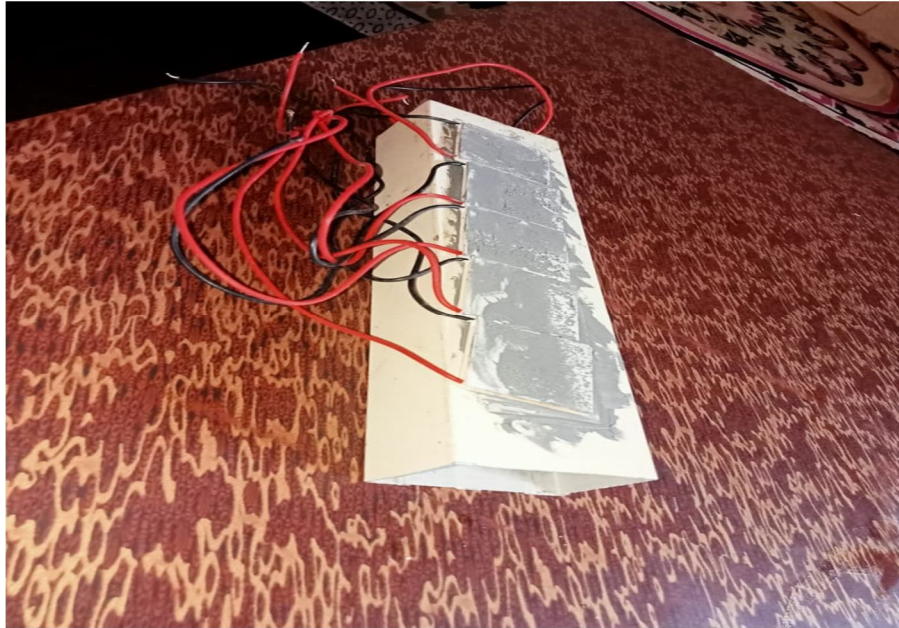


Figure 1. Peltier on hollow box

Though these experiments have conducted earlier but there is a problem how to cool these modules in scorching heat of sun. so this innovation is solution of that problem.

Another hollow box is placed and pasted on another layer of peltier by using thermal paste as shown in fig. 2. In the hollow boxes we filled a chemical which absorbs heat and also freezes very quickly.



Figure 2. peltier sandwiched between hollow boxes

We have used one solar panel to which generates electricity and this energy is used to run a mechanism which cools the chemical for the peltier. This mechanism is attached to the cold side of peltier modules surface. When there is sunny day the upper part of modules which is facing the sun heats up with the help of hot chemical filled inside the upper box. It transfers heat to the modules. And at the same time the solar panel starts generating electricity and send it to the inverter then inverter converts it in A.C. supply and then it starts cooling generator then it starts cooling the chemical which is filled in the hollow box attached to the cold side of peltier module surfaces as shown in Fig 3.



Figure 3. Arrangement Of Solar Panel, Inverter, and Peltier

Then after few minutes electricity generation starts from the peltier modules. So we make our project self dependent and is in small size.

VII. CIRCUIT DIAGRAM

The circuit diagram of our project is given below.

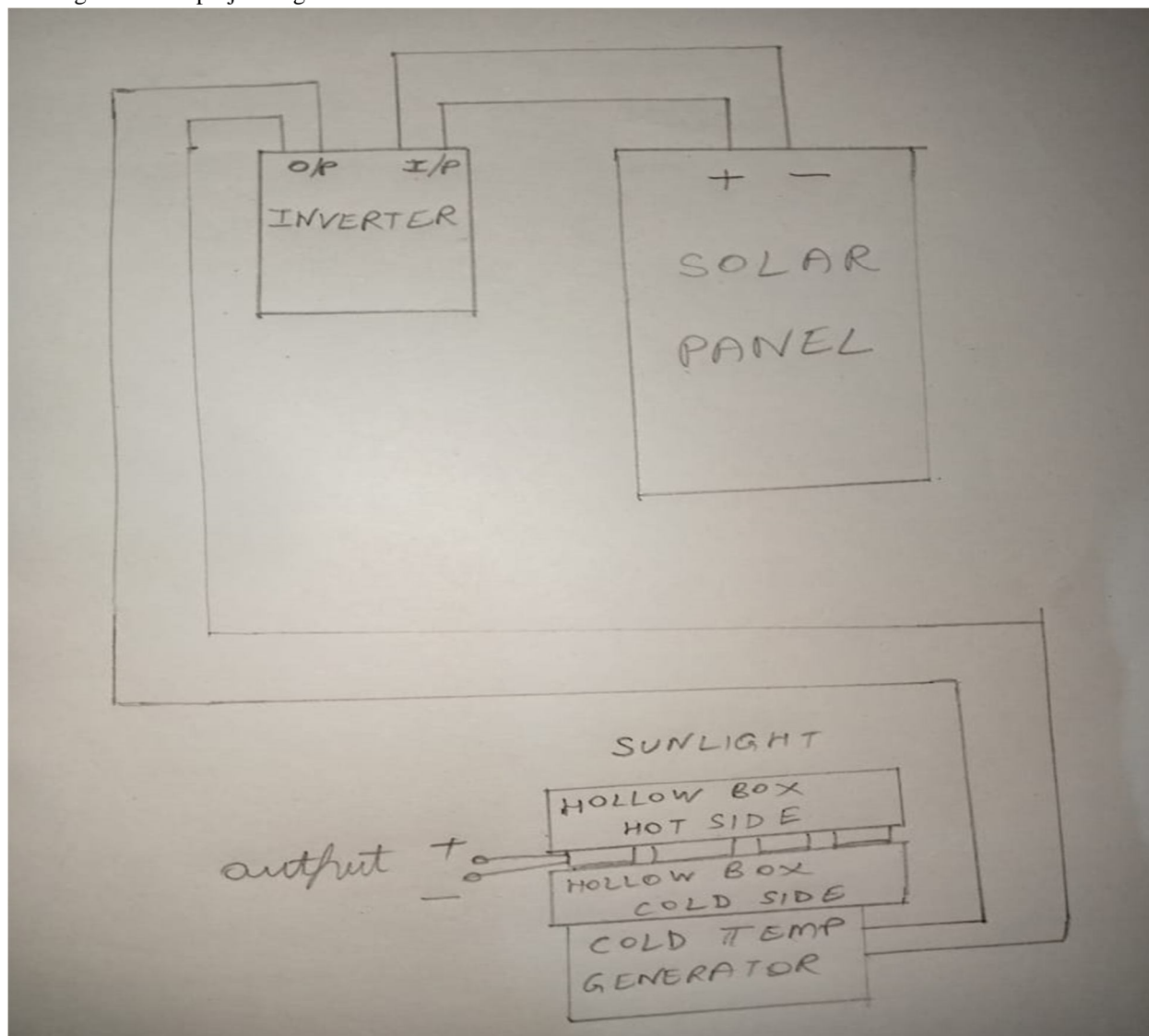


Figure.4. CIRCUIT DIAGRAM

VIII. METHODOLOGY

All the system is self dependent. Solar panel used here generates DC supply. As sunrise the solar panel starts generating electricity. It is connected to a inverter. It converts dc into AC. There is a need of AC because the cold air generator uses AC supply. This AC starts the cold air generator. As it starts it began to cool the chemical present in a box on which cold side of peltier is attached. Then after few minutes cold side of peltier gets cold.

Then comes the hot side. As the sun rises the sun rays falls on the box fixed on the hot side of peltier. Then heat of the sun gets trapped in chemical filled in the hollow box. After few minutes the peltier hot side starts getting hotter with the help of chemical. Then it starts generating electricity.

There are different rating of peltier modules. We used here are Tech1-12706. This rating means it generating capacity and output is 12 Volts and 6 ampere. Here we used 10 peltier modules. They are able to generate electricity much that is equal to the two 360 Watts solar panels only then when the peltier are provided with the favorable input conditions of generating electricity.

Peltier re small in size so they covered less area and are able to generate more amount of electricity as compared to the same wattage of solar panels.

IX. RESULTS

After doing this experiment and calculations we obtained the following results-

- 1) Electricity generation is more in less area as compared to solar panels.
- 2) Low or even zero maintenance.
- 3) Can be installed anywhere.
- 4) Can generate continuously even after clouds come in between sunlight and project.

X. CONCLUSIONS

- 1) The developed prototype works in a very simple manner.
- 2) Cost efficient.
- 3) In public places like stations or in homes this can be used anywhere.
- 4) Very easy to install.
- 5) No harmful chemicals are used.

REFERENCES

- [1] G. J. Snyder, "Thermoelectric Power Generation: Efficiency and Compatibility," in *Thermoelectrics Handbook Macro to Nano*, edited by D. M. Rowe (CRC, Boca Raton, 2006), Ch. 9.
- [2] M. Kishi, H. Nemoto, T. Hamao, M. Yamamoto, S. Sudou, M. Mandai, and S. Yamamoto, in *Eighteenth International Conference on Thermoelectrics Proceedings, ICT'99*, 301 (1999).
- [3] Thermoelectric generator. (2017, March 14). Retrieved March 20, 2017, from https://en.wikipedia.org/wiki/Thermoelectric_generator
- [4] Meyer, A., & Young, W. H. (1969). Thermoelectricity and Energy-Dependent Pseudopotentials. *Physical Review*, 184(3), 1003-1006. doi:10.1103/physrev.184.1003
- [5] Thermoelectricity abstracts. (1961). *Advanced Energy Conversion*, 1, 191-364. doi:10.1016/0365-1789(61)90034-0
- [6] Rosa, A. D. (2013). Thermoelectricity. *Fundamentals of Renewable Energy Processes*, 149-212. doi:10.1016/b978-0-12-397219-4.00005-9
- [7] Zhao Y., Gong S., Zhang C., Ge M., Xie L. Performance analysis of a solar photovoltaic power generation system with spray cooling *Case Stud Therm Eng*, 29 (2022), Article 101723
- [8] He W., Zhang J., Li H., Liu S., Wang Y., Lv B., Wei J. Optimal thermal management of server cooling system based cooling tower under different ambient temperature *Appl Therm Eng*, 207 (2022), Article 118176
- [9] Ge M., Zhao Y., Li Y., He W., Xie L., Zhao Y. Structural optimization of thermoelectric modules in a concentration photovoltaic-thermoelectric hybrid system *Energy*, 244 (2022), Article 123202
- [10] Shen Haishan, Lee Hoojeong, Han Seungwoo Optimization and fabrication of a planar thermoelectric generator for a high-performance solar thermoelectric generator *Curr Appl Phys*, 22 (2021), pp. 6-13



10.22214/IJRASET



45.98



IMPACT FACTOR:
7.129



IMPACT FACTOR:
7.429



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089  (24*7 Support on Whatsapp)