

Power Generation from waste heat by using Thermoelectric Generator

Sibu Harne*, Vilas Giradkar*, Jivan Sarva*, Komal Bagde*, Triveni Manwatkar*, Shweta Sawarkar

*Department of electrical engineering
Jhulelal Institute of Technology, Nagpur (M.S), India - 441110

ABSTRACT

Thermoelectric power generators have emerged as a promising another green technology due to their diverse advantages. Thermo Electric Power Generator directly converts this Thermal energy into Electrical energy. Thermoelectric is the science dealing with both low temperature and high-temperature thermal to electrical energy conversion systems.

Keywords: TEG, Waste heat, recovery, thermoelectric Generator, Heat transfer, cooling system

I. INTRODUCTION

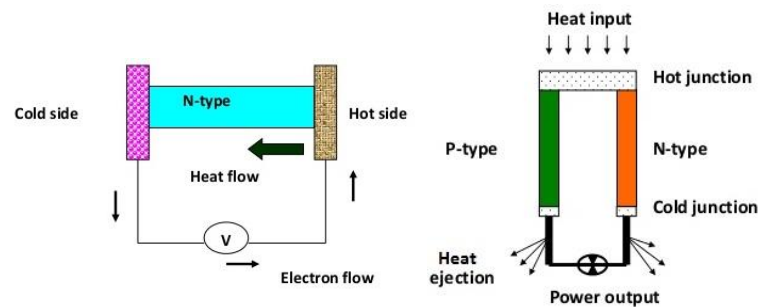
Thermoelectric generator (TEG) is a solid state technology that produces electricity when there is a temperature difference across the junctions of thermoelectric materials. Considering the presence of many potential waste heat recovery locations with consistent temperature and unlimited supply of sea water for cooling the TEG system, there is significant potential for applying TEG system. A TEG system consists of thermoelectric modules (array of thermoelectric material pairs), a hot-side heat extraction system, a cold-side heat dissipation system or cooling system and a power control device to deliver the desired electrical output.

However the waste heat is a certain volume of energy carrier which can still be utilized. One of the PRINCIPLE processing heats into electricity is a SEEBECK EFFECT. Its operation is based on the principle of thermoelectric phenomenon, which is known as a Seebeck phenomenon. The main aim of this project is to develop much cleaner noise less cost effective different way of power generation method for charging the battery as well as to utilization proper only the requirement of usage, which helps to reduce the global warming as well as reduce the power shortages, load shedding, etc. In this project the conversion of waste heat into generate

directly mobile battery and also stored in a rechargeable lead acid battery for further usage

II. THEORY OF THERMOELECTRIC

Thermoelectricity is a branch of science which introduces the experimental theme for the conversion of heat into electricity with the advent of some special materials called thermoelectric material using thermoelectric modules; a thermoelectric system generates power by taking in heat from a source such as a hot exhaust flue. The cold side must be cooled by air or water. Heat exchangers are used on both sides of the modules to supply this heating and cooling



Seebeck Effect

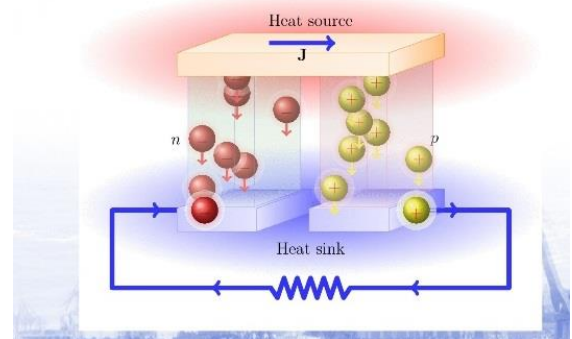


Fig .Semiconductor Thermoelectric Seebeck Effect

electricity by using thermoelectric generator. Waste may refrigerator heat, vehicle radiator heat, and it can be charged

III. BLOCK DIAGRAM.

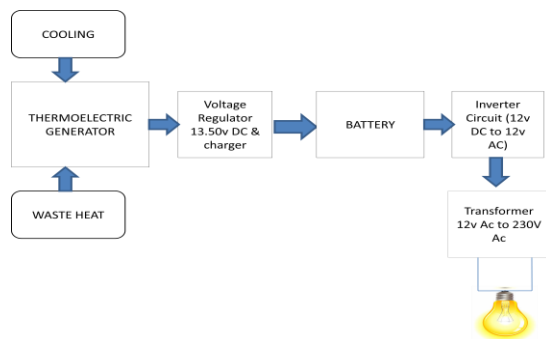
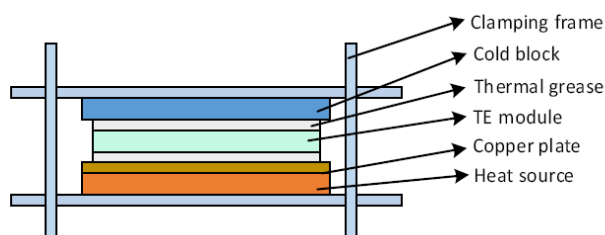
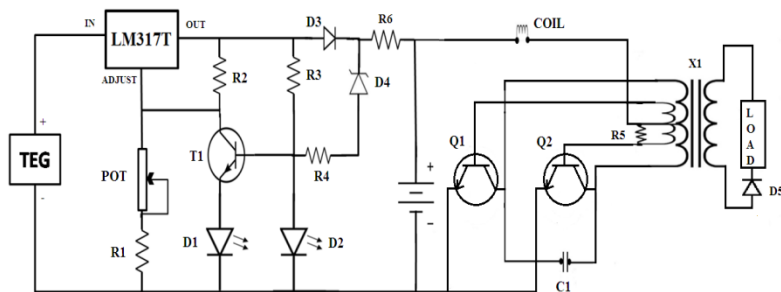


Fig. (a) With Storage System



Above figure shows that the hardware arrangement. In which the thermoelectric generators are connected in series and they are placed between the 0.6*15*35cm aluminum plate and 10*4*45 cm aluminum box. Heat is supplied to the aluminum plate. And cold water is forced circulate through aluminum box. To reduce the heat loss between plate, thermoelectric generator and box the thermal grease is used.

IV. CIRCUIT DIAGRAM



In our project we are arranging thermoelectric generators in such a manner that it generates DC power by maintaining the temperature difference. The temperature difference is maintained by providing hot temperature to one side and cold temperature on another side of the device .we are providing

hot temperature by iron coil and cold temperature by water cooling in close cycle with heat exchanger. By this arrangement the dc voltage (12v to 15v) gets generated, now this generated voltage is given to the voltage regulator circuit for maintaining the fluctuating dc voltage, this constant (13 volt dc) is provided to battery. As we provided constant dc voltage to the battery the battery will get charged to its maximum capacity and battery will provide constant 12 volt dc output to the inverter circuit (12 volt dc to 12 volt ac).We are using inverter circuit because the output of battery is 12 volt dc, we can't provide this dc voltage to our load therefore converting it to 12 Ac by this circuit. Now this 12 volt ac voltage is given to the transformer which is 12 volt ac to 230 volt ac and given to the load.

V. Advantages and disadvantages

Advantages

1. Noiseless process,
2. No moving parts,
3. High Reliability: Solid-state design ensures trouble free operation and the most reliable power supply system available.
4. Low Maintenance: 1 to 2 hours per year is a pro-active maintenance schedule.
5. Competitive Price: TEG systems have extremely competitive capital and operating costs for systems from 5 Watts to 5000 Watts and above.
6. Long Life: Single sealed thermopile has a 20 year design life with only 0.2% degradation per year. Generator field experience over 20 years.
7. Continuous Operation In All Conditions: Operation is not affected by weather, dust or other airborne contaminants.
8. Easy Operation: Single burner with a 20 year design life is easy to operate and stable in all weather conditions.

9. Reduced System Size: Physical layout of GPT TEG systems is smaller than solar or other generator other generator options.
10. Increased Security: GPT TEG installations are low visibility and can be mounted inside security shelters if required.
11. Reduced Battery Requirements: Due to continuous operation of TEGs.
12. Extended Battery Life: Due to decreased deep cycling.
13. Quality: TEGs are produced to ISO 9001 requirements.

Disadvantages

1. Low efficiency
2. High cost
3. High output resistance

VI. Observation

Temperature difference	IDEAL VALUE		MEASURED VALUE	
	o.c. voltage	o.c power current	open circuit voltage	power current
60 degrees	2.4 V	469 ma	2.6V	300ma
80 degrees	3.6 V	558 ma	2.9V	400ma
100 degrees	4.8 V	669 ma	3.23V	700ma

Conclusion

As we know that the energy consumption is going to be increasing day by day, for this power generation has to be increase.

Other generating sources can also generate power but they are not constant throughout the day(example solar works only in day time, hydro works only when plenty amount of water is available).

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