

THERMOELECTRIC POWER GENERATION SYSTEM BY USING TEG MODULE

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Abstract - Generating electricity in present there is a shortage of fuel, oil, gas, etc. burning of those fuels causes environmental problem like radio activity pollution, heating etc. so these (coal, oil, gas) limiting resources therefore ensuing new technology is required for electricity generation, by exploitation thermo electrical generators to get power as a most promising technology and environmental free and a number of other benefits in production. Thermo electrical generator will convert directly thermal (heat) energy into voltage. In this TEG there are not any moving elements and it can't be turn out any waste throughout power production and hence it is considered as a green technology. Thermo electrical power generation supply a possible application within the direct exchange of waste-heat energy into electric power wherever it's surplus to believe the value of the thermal energy input. This technique can have associate most outcome. the appliance of this selection inexperienced technology in changing waste-heat energy directly into electric power will too improve the efficiencies of energy conversion systems.

Keywords- *thermoelectrical generator, seebeck result, waste-heat recovery, various inexperienced technology, direct energy conversion, thermocouple junction, thermal defend, thermoelectrical materials, thermo electrical module, thermalfin*

1. INTRODUCTION

Recently we tend to square measure relying upon fossil fuels for max electricity generation. However, the reserves of fossil fuels are going to be goes on depleting, since oil & gas square measure the smallest amount sources. Recent years .cost of unit electricity has increasing to unpredictable levels due the less offer of (oil gas coal). Thus the , inexperienced energies square measure a lot of enticing artificial to electricity generation, because it will give a pollution free and price less. during this innovative project, we tend to square measure exploitation one device that is employed to be created and introduced by human as a renewable energy that's thermo electrical generator instrumentality to get electricity As we all know Renewable energies square measure, solar power, wind energy, hydro energy, periodic event energy, etc. higher than

energies will turn out electricity in several forms and method of generating technique. There square measure some disadvantages. star cells square measure the foremost normally utilized in applications like house industrial and satellite electrical systems. However, if there's no sun light-weight there'll no production of electricity various sources square measure necessary for generating electricity. or a technique of storing energy for future use. Wind and hydro electrical energy have their own disadvantage creating them less power production and inadequate for wider usage.. [3] The device by changing heat to voltage. This thermoelectrical generator is appropriate power for area analysis, Satellites and even un-manned facilities. Satellites square measure settled at the planets that thus for from the planet. as an example, thermoelectrical devices is utilized in vehicles to manufacturing electricity exploitation the waste heat of the engine conjointly. [2] TEG is employed to convert thermal energy (heat) into electricity supported Seebeck result directly. Here there's charge movement within the media. benefits of thermoelectrical power generators square measure. - tiny size and fewer weight. . - inexperienced Technology. - increase the overall potency (5%to 8%). -Alternative power sources of energy. -It need lessspace and price compare to different sourcewaste heat to get the facility is to decrease the cost-per-unit of the devices. TEG is utilized in , reaction engine elements, IC Engines elements, chamber cowl, plight tubes, white goods goods Computer/laptop Body heat etc

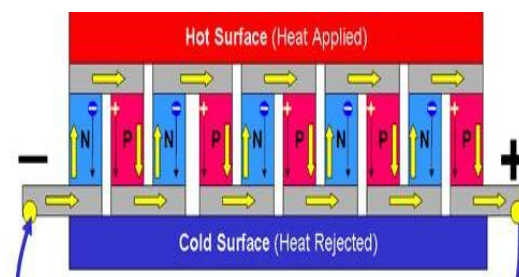


Fig.1: Schematic of a thermoelectrical generator

Theory and The Technology :

when electrons are in motion, we've associate electrical current (i.e., charge per unit time per unit area). electrical voltage (pressure) sometimes is that the drive however, different forces like temperature distinction and hence flow of thermal energy/heat will drive the electrons smart Power Generation From Waste Heat By Thermo electrical Generator

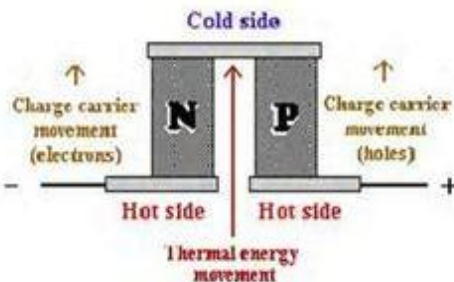


Fig.2: Schematics of a PN Couple

Background of the Thermo electrical Chip:

In 1821, J. T. Seebeck (1770-1831) discovered that dissimilar metals that square measure connected at 2 completely different locations (junctions) can develop a micro-voltage if the 2 junctions square measure command at different temperatures. This result is understood because the "Seebeck effect"

The United States of America of each N and P kind materials during a single power generation device permits us to actually optimize the Seebeck result. As shown in Fig. 1, the N and P pellets square measure organized thermally in parallel, however electrically during a circuit. as a result of electrical current (i.e., moving electrons) flows during a direction opposite to it of the outlet flow, the present-generating potentials within the pellets don't oppose each other, however square measure series-aiding. Thus, if every pellet developed a Seebeck voltage of 20mV, this mix of associate N pellet and a P pellet would generate about 40mv.

II. DRAWBACK DEFINITION

Some developing countries and most inhabited industrial countries (India china Mongolia Korea) etc. have average of three to ten hours of daily power-cuts as a result of the rise in demand of shopper utilization electricity exceeds so the assembly of voltage is lesser then the buyer demand. And conjointly shortage of fuel and coal i.e. concerning hour of electricity is generated from fossil fuels. (Oil and gas) square measure foreign from Arabian countries. so pollution conjointly might occur attributable to the combustion of this fuel. And conjointly the generating the facility from these

standard sources might cause harmful atmosphere and bemire the character.

In the new generation they're relying upon the reversible batteries or diesel /petrol engine etc. once there's no power and at the time of load shedding. the utilization of generator is common in industrial and industrial sector. This ultimately will increase the shortage of power and a lot of value.

And conjointly the individuals don't seem to be utilizing the facility properly they we tend to unnecessarily wasting the facility and that they don't seem to be planning the facility consumption properly therefore essentially a coffee power production therein conjointly wasting suggests that within the future we live while not light-weight currently a days shopper demand is a lot of then the facility production that's the key problem to beat.

Objective

The main aim of this project is to develop abundant cleaner noise less value effective completely different method of power generation technique for charging the battery still on utilization correct solely the need of usage, that helps to scale backs the world warming still as reduce the facility shortages, load shedding and conjointly we will transfer the transportable generating unit. during this project the conversion of waste heat into generate electricity by exploitation thermoelectrical generator. Waste might white goods heat, vehicle radiator heat, laptop computer heat, even body heat is used as a input supply as a waste heat to get electricity and it is charged directly mobile battery and conjointly keep during a reversible lead acid battery for any usage. And conjointly waste energy bod locomotion conjointly turn out electricity weight locomotion of the energy in to voltage by exploitation magnetic force induction principle. The management mechanism carries regulator circuit etc and therefore the power saving mechanism carries microcontroller relays etc.

- 1) Charge the mobile battery wherever ever waste heat is obtained
- 2) Maintain the warmth transfer from hot aspect to cold aspect due to uniform charging mobile battery
- 3) Charge the 12v battery for any usage to changing by exploitation electrical converter to 220v

III. SCOPE OF THE STUDY

The scopes of project study are;

- (1) By exploitation thermoelectrical generator connecting serial /parallel we will generate the facility for max level
- (2) even body heat conjointly generate the warmth that may be utilizing by exploitation lamb to get the facility to charge the transportable instrumentality like laptop computer mobile etc

(3) By put in within the vehicle higher than the radiator suggests that the vehicle battery can charge self.

IV. LITERATURE SURVEY

Method for generating power like burning of wood, petrol, diesel, coal, is unendingly depleting with nature, so exceeded usage of electricity per the buyer demand. Global warming is that the increase within the average measured temperature of the Earth's close to surface air and Oceans since the mid-20th century, and its projected continuation. world surface temperature multiplied zero.74 0.18 C (1.33 0.32 F) throughout the Thomas Jon Seebeck (1934) fictitious that a temperature fashioned between 2 dissimilar conductors produces a voltage and current. At the guts of the thermoelectrical generator result is that the proven fact that a temperature distinction during a conducting material ends up in heat flow between one aspect to a different aspect .

V. PROPOSED BLOCK DIAGRAM

This section provides the temporary description of every part utilized in planning the waste heat to get electricity By exploitation this thermoelectrical power generation (TEPG) TEC12706 devices shown once ever heating of 1 surface (waste heat example white goods outer surface heat, laptop computer heat, particle box heat, radiation heat ,even bod heat) is additionally associate input of thermo electrical generator.

When heat is applied one side there will be a continuous electron or holes will flow continuously based on the temperature of heat. If the temperature is increases the voltage is also increases vice verse in such a way that the other side of thermoelectric generator is cold because heat transform is uniform then only electron will flow and voltage is developed at the output side of the thermoelectric generator In this part voltage from the TEG is regulated by required voltage for mobile charger

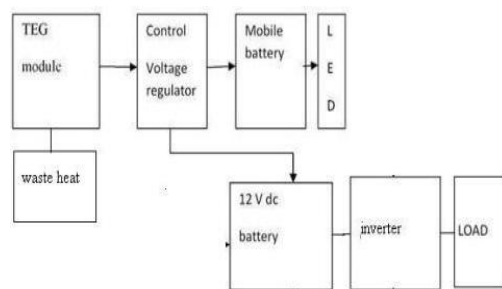


Fig. 3 : block diagram Voltage regulator (control circuit)

Mobile battery

After the regulated voltage is passed to the battery terminal to charge the mobile so that the required specification is 3.8 v li-ion batteries 5.70wh is required. Finally the mobile battery will charge under desired voltage condition

LED (light emitting diode)

Led indicates that mobile battery is charging or not if the led will not glow means there is no power at the output side and also the battery will not get charging. Inverter Used for to convert variable dc to fixed ac Thermoelectric generator construction and working principle:

A thermoelectric generator is a solid state flexible device that consists of a P-type and N-type semiconductor particle arranged in series, shown in Figure When heat is applied to one surface of the thermoelectric generator (hot side), N-type (electrons) semiconductor and the holes in the p-type semiconductor will moves out. This movement of electrons and holes that forms charge. A thermoelectric generator can be connected in series, which increases the voltage, the current.

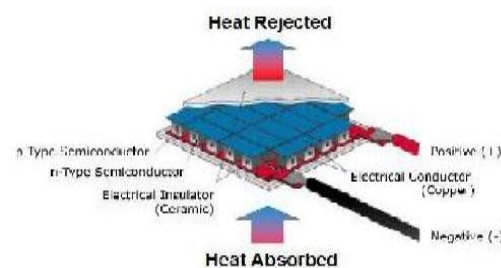


Fig 4: Schematic diagram of thermoelectric Generator

Seebeck Effect Jon seebeck invented the new designed circuit consisting of two (cold and hot side) different thermal conducting materials, whose connections based on the different temperatures. In case of a Peltier cooler module the Seebeck voltage can be determined by 1

$$V_S = \alpha (T_h - T_c) \quad (1)$$

where $T_h - T_c$ is the temp difference between heat applied and cold side of TEG.

TEG components

1. Thermoelectric internal elements
2. Thermoelectric covering
3. Thermal withstanding
4. Copper wire



Fig 5 : thermoelectric generator with fin heat sink

VI. CIRCUIT DIAGRAM

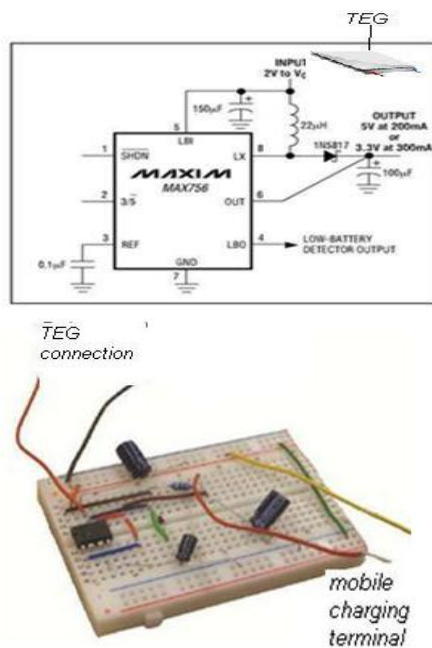


Fig.6:Circuit diagram Figure 1.5 potential unit From 1.5 potential unit Circuit Schematic

The MAX756/MAX757 square wave CMOS change of magnitude DC-DC switch regulators for tiny, low input voltage or powered systems. The MAX756 accepts a positive input voltage right down to zero.7V and converts it to a better pin-selectable output voltage of three.3V or 5V. The MAX757 is associate adjustable version that accepts associate input voltage right down to zero.7V and generates a better adjustable output voltage within the vary from a pair of.7V to 5.5V. Typical full-load efficiencies for the MAX756/MAX757 square measure bigger than eighty seven.

Max756 mix a switch-mode regulator with associate N-channel MOSFET, exactness voltage reference, and power-fail detector during a single monolithic device. The MOSFET could be a sense-FET kind for best potency, and contains a terribly

low gate threshold voltage to confirm start-up beneath low-battery voltage conditions (1.1V typ).

The circuit is simply wired on a awfully tiny rectangular common PCB. All connections ought to be unbroken as short as attainable. If offered, try to add a decent quality eight pin DIP socket for IC1. Note that the facility inductors (L1) DC resistance considerably affects potency. For highest potency, limit L1s DC resistance to zero.03 Ohm or less. A thru-hole kind commonplace power inductance is used. Similarly, the ESR of all capacitors (bypass and filter) affects circuit potency. Best performance is obtained by exploitation specialised low-ESR capacitors.

VII. TEST ANALYSIS

Testing by exploitation waste heat as a iron box
A) Complete setup to charge the mobile battery by exploitation thermoelectrical generator



Fig. 7 : charging the sample mobile battery using TEG by waste heat

complete setup to charge the mobile battery is shown in fig.7 once heat is applied to the recent aspect the lamb get absorb the warmth from any body (ex-refrigerator heat, laptop computer heat, heat from the vehicle, solar heat, and even bod is additionally a waste heat supply for TEG).

Under this once heat absorbs one aspect it rejected at the opposite aspect (cold side) heat transfer occur from hot surface to cold surface. so the lepton can flow to through copper conductor to the whole circuit thus voltage are going to be regulated at the circuit. the specified power for the mobile battery is three.8 potential unit it's at the output terminal at the circuit is as shown.

As it is heat transfer occur from heat applied aspect to cold aspect. These thermoelectrical generators of 2

terminals square measure to connected i.e. positive terminal is connected to diode aspect and therefore the different terminal is connected to ground Circuit parts incorporates Diode (BY127), Potentiometer (10kpot), Capacitor (50micro farad), Zener diode(6v), LED (3.5v), Mobile battery (3.8v).

When heat is applied to the recent aspect beneath bound temperature (30 to three hundred degree C) electric power from heat flow across a hot to cold aspect gradient.. a lot of thermoelectrical generator have to be compelled to be connected in cascade to form the most voltage. thermoelectrical device diode eliminates the reverse flow of lepton to the thermo electrical generator so unendingly lepton can flow through diode once applied heat to the lamb. Potentiometer is employed to regulate the voltage. Zener diode helps to eliminate the surplus voltage flow to the battery as a result of battery needed to charge.

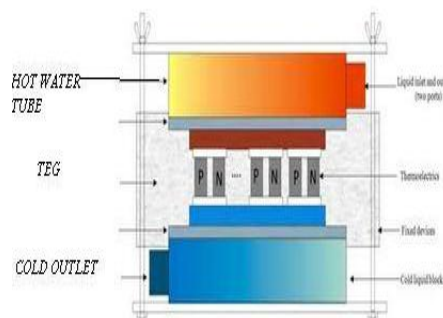


Fig. 8: shows the schematic of the module tests.

We unbroken the temperature on the recent aspect at concerning 200C by employing a digital thermostat oil bathtub and used the faucet water because the cooling liquid on the cold aspect with a temperature of concerning 20C. The temperatures of each hot and cold sides were measured and therefore the results square measure shown in graph. The temperature was measured exploitation 2 micro-thermocouples with terribly skinny tips. The temperature on the recent aspect of the modules was stable at concerning 180C which on the cold aspect at concerning 40C. the rise within the temperature on the cold aspect from twenty to 40C was due to the warmth physical phenomenon from the recent aspect through the lamb modules. The temperature distinction was stable at around 140C. The results illustrate that the take a look at system for thermoelectrical power generation was stable

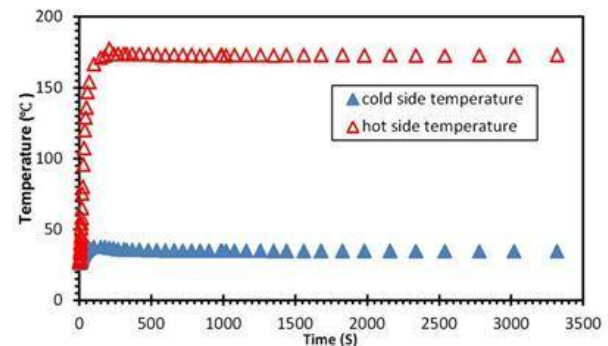


Fig. 9: Schematic of Simulation Results

c) Test analysis from burner

Fundamentally, there square measure four basic elements during a te-powered generator: a heat supply, a te, a cold-side conductor, associated an electrical load. The system may embody a voltage regulation circuit or a disciple for the warmth sink.

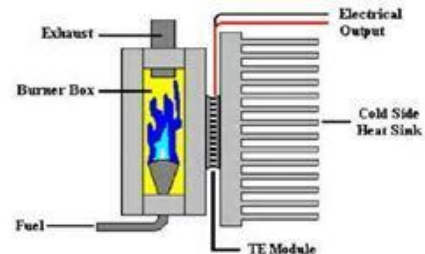


Fig. 10: Shows one example of such a system.

VIII. RESULT ANALYSIS

Primarily waste heat is employed to charge the battery. the system is tested to fulfill the required objectives and therefore the results obtained. For the analysis a T.E.G was putted on a hot chamber plate (body heat or iron box i'm exploitation here to urge quick output and therefore the metallic element conductor sq. formed is placed on the highest aspect (40x40x40) dimension. conductor of the opposite aspect of the thermo electrical generator (cold side) The hot plate (iron box) is sated at different temperature ranging from 30!to220!. So that to know the voltage and current by using multi meter that was produced by this TEG. by using thermometer to

determine the applied temperature exactly on the hot side of the TEG and cold side. The equation is gives to calculate the temperature of the T.E.G. Equation is given by

$$\text{Temperature } (\%T) = \text{Temperature Hot } (Th) - \text{Temperature Cold } (Tc)$$

CONCLUSION

Present method for electricity generation is converting thermal energy into energy by rotary engine then into electricity by exploitation generator. Burning of those fuels causes environmental drawback like radio activity pollution, heating. therefore (coal, oil, gas) square measure the limiting resources ensuing new technology is required. The project paper is tested and enforced. The system provides the simplest economical pollution free, needed energy resolution to the individuals. Two power generators are designed exploitation lamb modules and tested. the facility of the primary one may reach concerning five hundred W (predicted exploitation experimental data) with a temperature distinction of concerning 200C between hot and cold sides. This work is used for several applications in urban and rural areas wherever power handiness is a smaller amount or altogether absence. By creating this method generates and charge 12v that is capable to recharge a mobile. it avoiding dependency of grid offer. This is often a Promising technology for resolution power crisis to an inexpensive extent

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