

Article

An Innovative Approach for Extraction of Energy from Waste Heat Dissipation from Vehicle Engine Heat-up

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A B S T R A C T

Nowadays the need of energy increases day by day but only few sources of energy are available to produce or generate energy as our fuel resources are nearly coming to end. There are needs to be ways to use waste heat energy. There are some technologies which implement the recycling of waste heat by which waste heat can be trapped and recycle and reutilized. Most of the techniques currently available recover waste heat in the form of thermal energy which is then converted into electricity in a conventional thermal power plant. This production of energy efficiently from waste heat, thermoelectric generator module is used which works on See back Effect. Here, the power generation is simple, as there is need of only temperature difference to produce power but our method of conversion is something innovative by using the TEC (Thermo Electric Cooler), we are converting the heat energy to low voltages with the help of temperature differences that was created. Hence the voltages are very low so we are using the DC-DC boosters and buck converters, so that high amount of voltages is generated and stored in the battery and can use it for long time. Presently 65% of production of energy in automobiles is wasted in form of heat by exhaust gases. This paper tries to prove the feasibility of conversion of heat energy radiated from vehicle engine to produce electricity. As our system can work in any conditions and so it is very useful for daily life. Also it is capable of changing the whole automotive industry which is totally related to our system. By using this, energy is used to charge the mobile electronics, run home appliances, dc lighting.

Keywords: Thermo Electric Generator (TEG), Heat Energy, See Back Effect, Heat Radiation, Thermoelectric Material, Waste Heat Recovery

Introduction

Only about one-third of the energy in the fuel into mechanical power serving is to actually drive the automobile uniform after a extremely well-organized combustion engine

is changed. Most of the heat is lost in the surrounding or the vehicle is left with "waste heat". This leads to reduction in the CO₂ emission on which various engineers are trying to find new solutions.¹

As a title mention this system will prove to be an effective alternative for destroyed it will be distorted from one method to additional form. Solution for utilizing this waste heat energy into other form of energy required that is electric current by using Thermo Electric Coolers (TEC) peltier. This TEC plate was used in refrigerator for heating and cooling both, mainly for cooling by applying current.²

Basically, this transducer is working on the principle of thermo-couple technique in which it states that whenever there is a change among the two junctions of a material made with a combined element so that this temperature alteration makes the electron flow between the two-junction held at different temperature.³

To improve the competence and utilization a post generation the key is to renovate the wastage heat from vehicle to electrical energy that saves the energy which was getting exhausted in environment. There were many previous researches done on the extraction of this waste heat but it was difficult because of the heat energy conversion to electricity is very much stiff process with the help of turbine method and it was very much costly. But the system which is developed by use of TEC peltier is very much innovative and low cost. And can be produced in very large scale of electricity can be generated.⁴

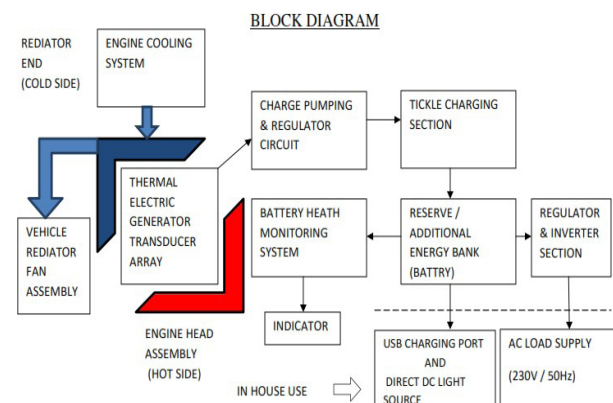
System Discription

Once the engine is started and acceleration is given to it. So the amount of heat is generated from engine and dissipated in the surrounding. By this process a very high amount of heat energy is generated, so by applying this heat energy at one of TEC peltier and other side is cooled automatically as the properties of TEC peltier suggest. As shown in diagram below, a system starts from a thermal electric energy generator which generates the electricity and supplied to the dc-dc boost circuit which then connected to charger for battery charging with irritate accusing method to feed up battery in very short time. In directive to preserve the temperature alteration amid hot junction and reference cold junction, an aluminum fin heat sink is on on the cold side with cooling fan assembly for the demonstration at local level. In real implementation of vehicle system this cooling Mechanism will be linked to the engine cooling system of vehicle.⁵

Also, the battery health monitoring system is included in circuit. On the Output side, battery protection circuit is used to avert the deep discharge by the load to ensure long battery life. As suggested in the system for daily life utilization, we have incorporated the inverter circuit for generation of 230 Volts ac mains ac supply to drive ac load. At the same time USB charging ports are provided for smart phone charging directly to avoid ac-dc conversion losses from normal plug-in mains charger.

This charger is careful to be unique of the significant portions as, we altogether usage smart phones today a day usually consumes near about 900 Watts a month. So, this system will help us to decrease that pointless wastage of the energy. With the same deliberation of conversion losses in mobile chargers we have deployed a dedicated dc lightening source which can drive the dc lightening source unswervingly. So, all this design growths the general competence of the system. An idea is future for turning the waste heat into a useful treasure. Here, the core technology is the TE generation that converts the waste heat of motor to the electrical energy.

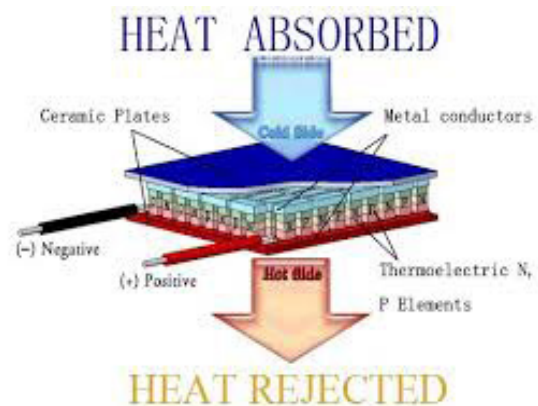
Block Diagram



Description of Equipments

Thermo Electric Cooler (TEC) Peltier

It's a thermoelectric cooler. It is available for our different requirements. This product ranges from 10*10mm -80*120mm with a power ranges from 1.6W-480W which are mostly used for cooling and heating applications. Its operation is done by applying hot on one side and cooler on another side of tec peltier. As we know that potential difference is created by this variation in tec peltier, thus it generates 1.2-2v voltage. These small voltages are also useful in this project, by using this voltage we may generate higher voltage that is useful in daily application.



Heating Coil

It is an iron coil plate which gets heated readily by applying input current. For our project we use iron coil plate for heating the peltier. This plate gets heated rapidly as the normal iron gets heated in short time. This iron plate is kept on a hot side of tec peltier. As this iron plate heats more thus its gives and more temperature variance to a peltier thus the voltage is generated at higher speed. There are much larger applications for iron coil plate for heating surfaces.

Heat Sink Assembly

With iron coil plate it will generate a large. This heat sink assembly is of 12V 5A. It is used in an application where the is too hot and we wanted that device to get cool in short period of time. This heat sink assembly's operation is done by applying in on cooler side of peltier. And by applying this peltier which is posed to higher heat gets cooled in short period of time and creating a much dissimilar temperature variation amount of voltage.

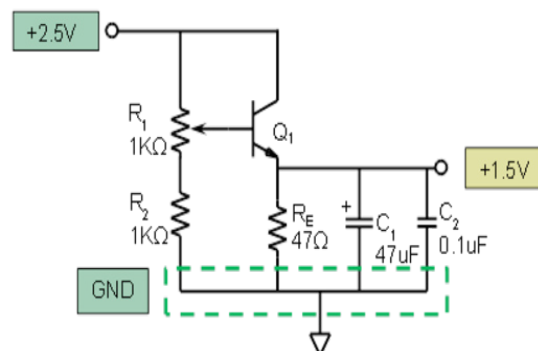


Radiator Fans

The radiator transmissions the heat from the fluid confidential to the air external, thus cooling the fluid, which in turn cools the engine. Radiators are also frequently used to cool involuntary transmission fluids, air conditioner refrigerant, intake air and occasionally to unruffled motor oil or power steering fluid. Radiators are characteristically mounted in a location where they obtain airflow from the forward drive of the vehicle, such as behind a front grill. Where engines are mid-or rear-mounted, it is mutual to mount the radiator behind a front grill to attain adequate airflow, even however this requires long coolant pipes.

DC-DC Booster

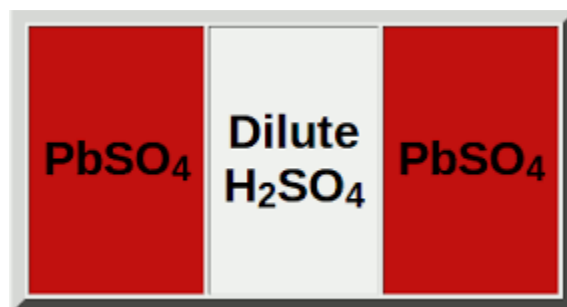
It is a device which changes a small voltage to a higher voltage in dc current. The voltage that is produced from peltier due to temperature variation is small voltage and for our application the voltage should be least 5V. To attain this DC-DC booster is connected to end terminals of peltier and the amount of voltage that is generated from peltier and gets converted to minimum 5V.



The connections in the green box are ground #1

Battery

The lead-acid battery remained conceived in 1859 by French physicist Gaston Planet and is the eldest kind of rechargeable battery. Notwithstanding having a very low energy-to- weight ratio and a low energy-to-volume ratio, its aptitude to source high surge currents resources that the cells have a comparatively large power to weight ratio. These structures, along with their low cost, make it good-looking for use in motor vehicles to deliver the high current obligatory by automobile starter motor.



Power Inverter

An inverter is a device that converts direct current to an alternating current. An inverter fixes not produce any power hence the power is provided by direct current source. And the output power is an alternate current. For our application the current should be in AC that's the reason we use an inverter.

Advantages

- TEGs have no affecting parts during their processes so conservation obligatory is less.
- Flexible shape, very small size.
- Well-organized way to usage waste energy hence healthier application of power.
- Save money and reduce general price to run insignificant home appliances.

Future Scope

As currently we have proposed a system for utilization of own level so it can be incorporated in smart grid concept

to provide unused energy by us to the grid so others can use this energy we can reduce the bills.

Conclusion

Thus, this system is actual abundant eco-friendly and reasonable since of the procurement the energy from the waste heat from the engine. The chief motto of this paper is to except the unwanted heat that was degenerate from the vehicle engine is extracted. And as we can also use this electricity obtained at our household because the current is converted to AC. This system can be made on large commercial bases, as it is very much efficient. We have successfully attained our detached by storing the charge in the battery and can be used for many hours uninterruptedly. As we are using the tec peltier in series, so that we can yield high voltage subsequently the devices or the purposes can be used for large time period.

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