Abstract: Thermoelectric generator produces electric current from heat and it is a solid state devices. It contains on moving parts and are completely silent as like traditional dynamic heat engines. It can easily be operated with small heat sources and with small differences in temperatures. Due to great amount of waste heat emitted by internal combustion engine operation, there is possibility of 3-5 % useful electricity generation is possible.

Keywords: Thermoelectric generator (TEG), Nanostructured, Thin-film super lattice, Bi2te3, used in cars automobile

1. Introduction

Thermoelectric generators serve a range of applications. Curiosity, the waste recovery uses thermoelectric generators for power, and many automobile manufacturers are using or experimenting with the technology for use in cars automobile.

However, the largest energy impact that thermoelectric generators could deliver is in larger scale implementations in power plants and factories, where continuous running of combustion engines expend tremendous amounts of waste heat. The generators have yet to be widely applied to these broader potentials, though advancements in efficiency are incentivizing their adoption in manufacturing industrial.

2. Problem analyzed

2.1 Primary problem

In first technique, a thermoelectric generator placed on a hot plate, while a beaker of ice was placed on the top side of TEG. At different temperature ranging °C, the hot plate was set to determine how much voltage and current was produced by using this device. Since hot plate didn’t have precise temperature settings, a thermometer is used. for determining the exact temperature produced in the hot plate. A thermometer was placed in a beaker of water that was placed on hot plate. To determine the Temperature gradient in addition thermometer was placed to measure the ice temperature differences. since the hot side has maximum temperature of 260°C where cold side had maximum temperature of 100°C. If the temperature gradient excess the limits, the TEG inner components will break (or ) damaged. This Causes the outcome of voltage and current low.

2.2 secondary problem

In the second technique thermoelectric generator placed on hot plate, while aluminum heat sink placed on top side TEG. To prevent heat the aluminum heat sink was an top square made from aluminum foil. The inside heat sink spitted into five, 40 mm in length, width and height. The procedures used in Technique 2 are same as in technique. 1. By using this technique the voltage is increased by .7 V while compared to prevent technique. But the problem in this technique TEG weren’t efficient enough to power up the components that produced.

3. Main Components

3.1 Engine setup

A system which that coverts heat to mechanical energy and that energy used for mechanical work. It is worked by bringing a higher state temperature to low state temperature. During this process electric current is generated by the conversion of thermal energy by the exploiting the properties of working substance.
3.2 Silencer

Mufflers are not designed to serve primary as exhaust function and it is installed within the exhaust system in most of the engines. The mufflers is used to reduce the loudness of sound created by engine of quiet acquiring. The major sound pressure produced emanated out of vehicle using the same piping used by silent exhaust heat absorbed by series of passages and chambers.

3.3 Petrol tank

It is featured for multipurpose using including storage.

3.4 Primary Aluminium Hot fins

The power electronic semiconductor and assembly are tailored by bonded fin and folded fin air cooled sinks. Cool sink fins offers very safe portable petrol and collection and for long term petrol storage. these petrol tanks are designed to hold the pressure within and always covered with manufacturer warranty.[11]

3.5 Secondary aluminium cool fins

The Basic function of aluminum fin is conduct efficiently heat transfer and is used in variety of heat exchange constructions. Evaporators and condensers coils are applications of Aluminum foil fins .In additions to these, foil fins used in base board space heater, humidifier, dehumidifier of different types and other equipment resistance is possible on unique internal design less thermal resistance. Ultra low thermal

3.6 Step up transformer

These devices are used for step up voltage in applications of energy harvesting and there are step –p and step – down transformer and [12]it is based on the number of windings between the primary and secondary coils. The device has windings to windings and offers 300V and combination of high and high efficiency on low DCR.[13]
3.7 Thermoelectric generator

Thermoelectric generators produce electric current from heat and it is a solid state devices. It contains no moving parts and are completely silent unlike traditional dynamic heat engines. It can easily be operated with small heat sources and small differences in temperature. Due to great amount of waste heat emitted by internal combustion engine operation, here is possibly of 3-5% useful electricity generation is possible.[14]

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4. Temperature distribution in ansys

MAX TEMPERATURE=100
MIN TEMPERATURE =40

\[
Q_{\text{tot}} = -\left(\frac{88}{2} \cdot I^2\right) + [0.93 \cdot T_{\text{MAX}} + (K \cdot \Delta T)]
\]

\[
= -\left(\frac{285}{2} \times 0.93^2\right) + (0.035 \times 0.93 \times 100) + (0.35 \times 50)
\]

\[
= -1.925 \times 0.8649 + 3.255 + 0.35 \times 50
\]

\[
= -1.6649 + 3.255 + 17.5
\]

\[
Q_{\text{hot}} = 19.0901
\]

6. Applications

Thermoelectric generators serve a range of applications. Curiosity, the waste recovery uses thermoelectric generators for power, and many automobile manufacturers[15]are using or experimenting with the technology for use in cars automobile. However, the largest energy impact that thermoelectric generators could deliver is in larger scale implementations in power plants and factories, where continuous running of combustion engines expend tremendous amounts of waste heat. The generators have yet to be widely applied to these broader potentials, though advancements in efficiency are incentivizing their adoption in manufacturing industrial.[19-21]

7. Conclusion

Based on thermodynamic theory, law of conservation of energy, semiconductor theory and model of TEG based on analytical model will be developed. From various papers, the studied result shown that the efficiency and power generation by various method of thermoelectric generates is very low. The output power per unit area is independent of number of thermo legs and cross section area according to the analysis. So to improve the
efficiency of the TEG by modifying the parameters and design methodology.

References


