

Fabrication of Multipurpose Heat Exchanger to Convert Heat Energy into Electricity

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Abstract: The aim of the project is to convert the waste heat that obtained from the steel plant into useful work. This project works on the principle of seebeck effect and it is one of the direct energy conversion techniques. The seebeck effect is the phenomenon in which temperature difference between 2 dissimilar electrical conductors produces voltage difference between them. The thesis focuses on the fabrication of the heat exchanger in order to produce electricity by using seebeck effect. The analytical work is carried out by using Arduino software and the temperature from both the heat exchangers is measured by using LM35DT sensor. In this project maximum of 135°C is produced which is used to light up 100Wbulb.

Keywords: TEC modules, Heat Exchangers, LM35DT sensor, Microcontroller

1. Introduction

At present the burning issue around all over the world is energy crisis due to lack of non-renewable energy resources. There is huge amount of energy is released from industries as waste heat. Our aim is to convert the waste heat into electrical energy by using see beck principle. It is the phenomenon in which the temperature difference between 2 dissimilar electrical conductors produce voltage difference between them. By considering the waste heat that is available in the steel plant that is best utilized to produce electricity. A device named thermoelectric generator is used for this purpose. The temperature at the steel plant is very high, in order to create that atmosphere, we are using Induction spring which produces heat energy by using electrical energy based on the principle of resistance. The heat energy liberated by the ignition coil is equal to heat liberated by cooling the molten metal in steel plant. By using Peltier module and thermoelectric generator we can produce the electricity by the principle of see beck effect.

2. Dimensions of Heat Exchanger

The Fabricated heat exchanger is dimensions

- Height: 14 inches
- Length: 9 inches

The dimensions are taken from the heat exchanger that is available at the vizag steel plant. The most important dimension is the distance between the two heat producing induction coils that plays a vital role in the formation of hot side for

thermocouple. In the fabrication of prototype 2 heat exchangers are used one is on the left side and other is on the right side of the prototype. The distance between both coils is 9 inches in which if the distance between the coils increases then heat transfer decreases.

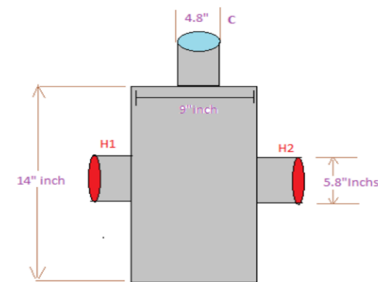


Fig. 1. Heat exchanger prototype

3. Fabrication

The metal taken here is a sheet metal and subjected to perform the following sheet metal operations. The required properties are

Thickness: 3.5 mm

Thermal conductivity: 205W/mK

The operations performed on the sheet metal are bending, spinning, punching.

4. Components of prototype

A. Thermoelectric generator

Thermoelectric generator is a device that converts heat directly into electrical energy through a phenomenon called see beck effect. Thermoelectric generators could be used in power plants in order to convert waste heat into additional electrical power. Another application is radioisotope thermoelectric generators which are used in space probes.

B. Heat exchanger

Heat Exchangers are most commonly used to transfer heat from combustion exhaust gases to combustion air entering the furnace. Since preheated combustion air enters the furnace at high temperature, less energy must be supplied by the fuel.

C. Peltier Module

A typical thermoelectric module consists of an array of

which is 50mA and voltage changes continuously with temperature.

6. Conclusion

The aim of the project is achieved by conversion of waste heat that is available at the steel plant into useful work.

1. In this work electricity of 10V is produced which is utilized to glow a bulb of 100W which is the main motto of this work.
2. In steel plant only from blast furnace 2000°C of heat is released. With that much heat we produce huge amount of electrical energy.
3. From the above work it may consider as Peltier and seebeck

effects are one of the most promising concepts to achieve effective use of waste heat recovery from industries and plants etc.

References

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