Concept of Power Generation from Waste Heat Using Thermoelectric Generator

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Abstract— This paper presents the investigation of power generation using the mixture of heat and thermo-electric generators. A majority of thermal energy within the industry is dissipated as waste heat to the environment. This waste heat is often utilized further for power generation. The related problems of world warming and dwindling fuel supplies have led to improving the efficiency of any process being a priority. One method to reinforce the efficiency is to develop methods to utilize waste heat that's usually wasted. Two promising technologies that were found to be useful for this purpose were thermoelectric generators and heat pipes. Therefore, this project involved making a bench type, proof of concept model of power production by thermoelectric generators using heat pipes and simulated hot air.

Keywords: Waste Heat, Waste Heat Recovery, Thermoelectric Generator Module, Controller, Electricity

I. INTRODUCTION

In this paper the conversion of the heat energy in to power. By using this energy fan will operates and therefore the energy is stored in an exceedingly battery. The control mechanism carries the A.C ripples neutralizer, unidirectional current controller and 12V, from this battery supply will pass to the inverter and it is employed to drive AC/DC loads. The battery is connected to the inverter. This inverter is employed to convert the 12 Volt D.C to the 230 Volt A.C. This 230 Volt A.C voltage is employed to activate the masses. We are using 8051 microcontroller AT 89S52 with 16*2 LCD display the voltage from the values of battery. In this project we are using TEP Transducer .Transducer could be a device which converts one kind of energy in to a different kind of energy.

This includes electrical, mechanical, light and heat energy also. While the term transducer commonly implies the utilization of sensors/detector any device which converts energy considered as Transducer. The following literature papers are studies for the completion of prototype.

A. Field Of Invention

This invention relates to the inner Combustion machineries for production in industry. Among all research directions, waste heat recovery (WHR) is most concerned, because of the widespread existence and high accessibility of suitable resources. in line with India Bureau of Energy Efficiency , the advantages of WHR includes reduction within the process consumption and costs, reduction in pollution and equipment sizes, and also reduction in auxiliary energy consumption. While there are variety of devices to meet WHR, thermoelectric generator (TEG) has been utilized in most automotive applications. A thermoelectric power generator could be a solid s device which waste heat into current which works on seebeck effect.

B. Background of Invention

In recent years, warming and therefore the limitations in use of energy resources increase environmental problems with emissions. The odds of thermoelectric frameworks' commitment to "green" innovations, explicitly for squander heat recuperation from industry depleting vent gases. Vast quantities of waste heat are discharged into the earth's environment much of it at temperatures which are too low to recover using conventional wattage generators. The proposed structure could be a distributed multi-section and multi-stage network. The target is to tackle problems facing the standard single-stage system and to advance TEG application in automotive settings.

Bottom of Form

C. Objectives

The current research is that specialize in a technology, which is ready to convert the thermal energy contained within the exhaust gas directly into electrical power. during this project concept it invented exhaust gas-based thermoelectric power generator for an industry application. during this invention, the exhaust gas gases within the pipe provide the warmth source to the thermoelectric power generator. So, this project proposes and implements a thermoelectric waste energy recovery system from the exhaust heat from running machineries. The secret's to directly convert the warmth energy from automotive waste heat to voltage employing a thermoelectric generator. While the electrical power generation by such a system is ready to get remains relatively small at a maximum of 10 W from one TEG module, rapid progress in materials research can make the ambitious objective of generating higher watts by all means of feasible proposition.

II. BLOCK DIAGRAM

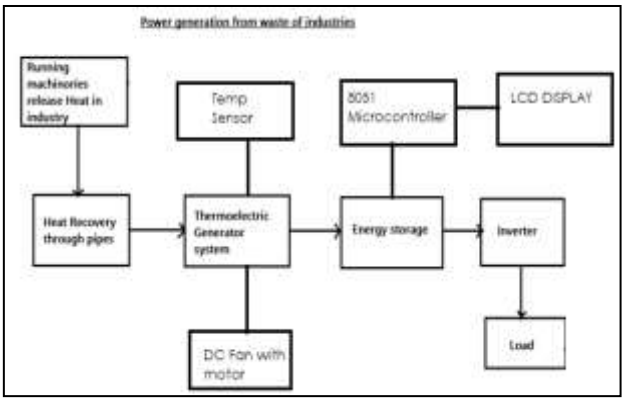

Fig. 1: Block Diagram

III. WORKING

Non-conventional energy using is converting mechanical energy into the electrical energy. Here in this project a power generation arrangement is made. Use of thermoelectric principle makes this system efficient and reliable.

In any industry machineries continuously run for their production. It release large amount of heat. This is wastage heat. We utilized this wastage heat to produce electricity. In this way we can minimize some amount air pollution also.

When we apply TEG with Heat sink module to wastage heat through heat pipe executed from machine. Then at the same time TEG starts converting Heat energy into Electrical energy. We can measure this heat with the help of temperature sensor attached to the system.

One DC fan is attached to system to indicates the flow and conversion of heat energy into Electrical energy . As the amount of temperature is increases, the flow of fan is also increases.

Generated electrical energy is stored in battery. This stored energy is supply to inverter to convert DC to AC. At the output AC load is obtain. This AC load is utilized to run various loads in same industry like, fan, AC , light etc. We also attached 8051 microcontroller (AT89S52) with LCD display to measure the amount of voltage stored and remaining in battery.

In this way, whole system work. Start from wastage of heat dissipated in industry through production process. Then conversion of heat into electricity. Indication of conversion electricity through DC fan and motor. Storage of electricity in battery. Conversion of DC voltage to AC voltage with help of inverter. Microcontroller attached to show the voltage present at battery. And last AC load attached to inverter.

If such system utilized in industry, the amount of wastage heat we can utilized it. And also minimized air pollution problem cussing in industry.

IV. TEG WORKING PRINCIPLE

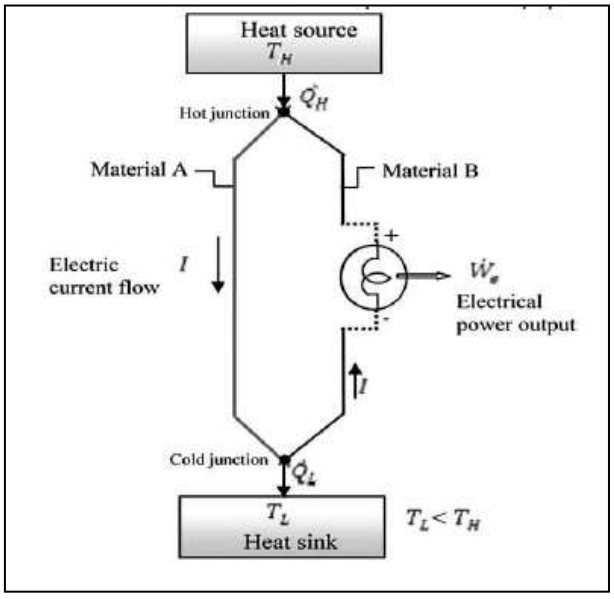

Fig. 2: Principle of thermoelectric generator

TEG consists of one hot side and one cold side. The hot side with higher temperature, will drive electrons in the n-type leg toward the cold side with lower temperature, which cross the metallic interconnect, and pass into the p-type leg, thus developing a current through the circuit as sown in Fig.. Holes in the p-type leg will then follow in the direction of the current. The current can then be used to power a load.

If temperature difference is kept constant, then the diffusion of charge carriers will form a constant heat current, hence a constant electrical current. If the rate of diffusion carriers were equal, there would be no net change in charge within the TE leg.

T1= Hot side inlet temperature
T2= Hot side outlet temperature
T3= Cold side inlet temperature
T4= Cold side outlet temperature
Tin= Exhaust gas temperature at TEG system inlet
Tex= Exhaust gas temperature at TEG system exit

V. EXPERIMENTAL PROJECT IMAGE

VI. SCOPE OF THE STUDY

- By using thermoelectric generator connecting in series /parallel we can generate the power for maximum level
- Even body heat also generate the heat that can be utilizing by using TEG to generate the power to charge the portable equipment like laptop mobile etc
- By installed in the vehicle above the radiator means the vehicle battery will charge self.

VII. ADVANTAGES

- Clean, Noise less, Cost is less.
- This is a Non-conventional system ,No fuel is require
- Easy maintenance, portable, Charging time is less (maximum temp)
- Promising technology for solving power crisis to an affordable extent.
- Simple in construction, Pollution free, Reduces transmission losses.
- Wide areas of application# Required less space
- It can be use at any time when it necessary.
- Less number of parts required.
- we can charge any electronic devices
- Electricity can used for many purposes
- Efficient and eliminate the grid searching.

VIII. DISADVANTAGES

- Improper variation of temperature gradient difference may damage the TEG, Complex design.

IX. APPLICATIONS

- Thermoelectric Generators are basically used in where the power production is less.
- In many industries amount of heat is executed and been wastage. We can used this hear for electricity using TEG.
- In automobile vehicle produce heat that can be used for generating electricity by using TEG.
- Recharge the battery where ever waste heat is obtained. Self-charging battery by fixing the TEG at radiator or two wheeler silencers pipe.

X. CONCLUSION

Waste heat recovery entails capturing and reusing the waste heat from machineries in industries and using it for generating electrical work. It would also help to recognize the improvement in performance and emissions of the machineries if these technologies were adopted by the production industries.

If this concept of thermoelectric system is taken to the practical level then there will be large amount of electricity can be generated, which will be used to run industrial load itself. Also large amount of wastage heat for pollution is also uses in this system in continue manner. And such industries also somehow help to protect the environmental pollution.

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