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DESIGN & FABRICATION OF MUFFLER FOR WASTE HEAT RECOVERY BY USING THERMOELECTRIC GENERATOR

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ABSTRACT–In Automobile sector mostly IC engine is used for power generation. This device have high heat losses through exhaust and coolant of the engine in the form of heat. About 60% amount of heat is wasted to atmosphere through the muffler. A huge amount of energy is lost during power generation, so there is necessity to trap this wasted heat losses. This paper proposes a design and fabrication of waste heat recovery system using thermoelectric generator. This experimental result proved that proposed system recovers certain amount of heat energy which can be used for two wheeler auxiliary device.

Keywords- IC Engine, Heat energy recovery, TEG.

I. INTRODUCTION

In Automobile industry IC engine is a device which is widely used. From IC engine lots of energy is lost in the form of heat from engine exhaust manifold. During the combustion process 40% of heat its lost through waste gas exhaust and 35% by coolant. A small fraction of waste heat could be converted into useful energy. Rather than directly improving engine. Efficiency efforts are being made to increase the efficiency indirectly by using waste heat recovery system. Thermoelectric generator has best option for waste heat recovery system. Thermoelectric generator is a device use for converting thermal energy into electrical energy based on seebeck principle.

The TEG device using this automobile waste exhaust as heat source to reduce ICE load as well as alternator thus decrease the fuel consumption and environmental pollution. TEG have lot of attributes such as no moving parts, environmentally friendly and have a low maintenance. We convert waste heat into electricity by using seebeck effect and generated electricity is transfer to battery and other electronic device of vehicle.^[1]

II. LITERATURE REVIEW

International journal of advanced mechanical engineering published a paper 2017. Titled “Design and fabrication of silencer waste heat power generation system using thermoelectric generator”. This paper was published by M. G. Jadhav, J. S. Sidhu. The study was made on waste heat recovery from silencer by using TEG. In this paper presents the waste heat recovery device is useful in automobile sector to increased efficiency of engine so the aim of this project is to recover the waste heat from the exhaust of IC engine.^[2]

International journal of current engineering and technology published a paper 2016 Titled “Thermoelectric power generation using waste heat energy from internal combustion engine”. This paper was published by D. T. Kashid, S. H. Barhatte, D. S. Ghodke about 40% of the overall fuel energy losses in combustion engine as waste heat hence the TEG system traps the waste heat of exhaust gases from engine and generates useful power which are used to charge battery it increase the efficiency.^[3]

III. PROBLEM STATEMENT

To design and develop waste heat recovery system for two wheeler exhaust using thermoelectric generator and utilizing the energy for various electrical applications in the vehicle like mobile charging unit, lightning various lamps and indicators, giving supply to various sensors.

IV. COMPONENT DESCRIPTION

Thermoelectric generator: A basically thermoelectric generator converts heat into electricity using a phenomenon called as seebecks effect. There are mostly three types of thermoelectrical modules. Yet we had chosen the Bismuth Telluride, which has required operating temperature as well as it is easily available at low cost.^[2]

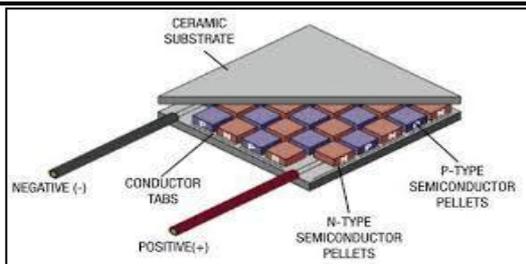


Figure.1 Thermoelectric generator

Aluminium heat sink: It is a flat back type aluminium heat sink. For cooling purpose number of fins are provided on aluminium heat sink. Aluminium heat sink used because it has high thermal conductivity & easily available. Also it has low cost and light in weight.^[2]

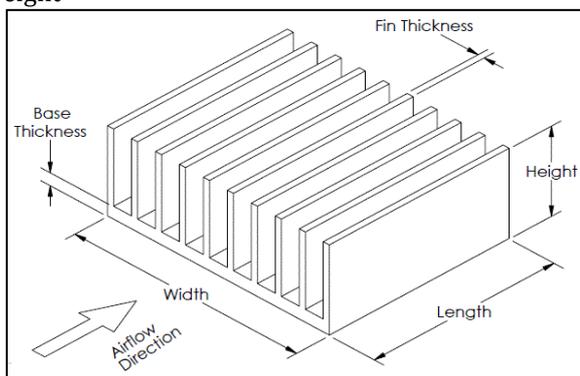


Figure.2 Aluminium Heat Sink

Teflon sheet: The Teflon cover sheet is multifunctional necessity when using sublimation or heat transfer. It protect TEG from overheating.

Gasket: Gasket is a sealing material placed between mating surfaces, which will maintain the leakage proof sealing in all operating condition. Primary function of gasket is to seal irregularity between the mating part.so that there will be no leakage of service fluid from the flange joined.^[4]

V. WORKING

In IC engine whenever power is produce, some amount of energy is wasted to atmosphere through muffler in form of heat. Now waste heat recovery unit is place between engine and exhaust pipe. The high temperature gases from the engine passes through aluminum block (heat source). Thermoelectric generator is place between aluminum block (heat source) and aluminum fins(heat sink).whenever the exhaust gases pass through aluminum block its get heated .as aluminum block act as heat source ,it transfers the heat to the thermoelectric generator.as there is heat side and cold side ,produce seebeck effect. This effect can be used to generate electricity, which can be used to charge the battery .various lighting lamp & indicators, mobile charging etc.

VI. FUTURE SCOPE

This Project helps to achieving sustainable alternative energy. We can use this project where see back effect is available. We can minimize the losses through the engine exhaust and increased the efficiency of the

engine. We can take different types TEG as per required operating temperature.^[5]

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