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Fabrication of Power Production from Exhaust Gas of an Engine

Udhayakumar. V[1], Deepanraj.M[2], Dhanapal.A[3], Dheenadhayalan.K4, Manivel.R[5]
[1]*Assistant Professor,* [2,3,4,5]*UG Students, Mechanical Engineering, Excel Engineering College, Komarapalayam, Tamilnadu, India*

Abstract: ***In this research work the modification of spark ignition engine for producing power using turbine. Nowadays in automobile field many new innovating concepts are being developed. We are using the power from vehicle exhaust to generate the electricity which can be stored in battery for the later consumption. In this project, we are demonstrating a concept of generating power in a stationary single cylinder engine by the usage of turbines. Here we are placing a turbine in the path of exhaust near the silencer. The turbine is connected to a dynamo, which is used to generate power. Depending upon the exhaust flow the turbine rotates, and this causes the dynamo to rotate. A dynamo is a device which is used to convert the mechanical energy into electrical energy. The generated power is stored to the battery. It can be stored in the battery after rectification. The rectified voltage can be inverted and used in various forms of utilities.***
Keywords: Turbines, Engine, Exhaust gas & Electrical energy

I. INTRODUCTION

In recent years the scientific and public awareness on environmental and energy issues has brought in major interests to the research of advanced technologies particularly in highly efficient internal combustion engines. Viewing from the socioeconomic perspective, as the level of energy consumption is directly proportional to the economic development and total number of population in a country, the growing rate of population in the world today indicates that the energy demand is likely to increase. Substantial thermal energy is available from the exhaust gas in modern automotive engines. Two-thirds of the energy from combustion in a vehicle is lost as waste heat, of which 40% is in the form of hot exhaust gas. The latest developments and technologies on waste heat recovery of exhaust gas from internal combustion engines (ICE). These include thermoelectric generators (TEG), Organic Rankine cycle (ORC), six-stroke cycle IC engine and new developments on turbocharger technology. Being one of the promising new devices for an automotive waste heat recovery, thermoelectric generators (TEG) will become one of the most important and outstanding devices in the future. A thermoelectric power generator is a solid state device that provides direct energy conversion from thermal energy (heat) due to a temperature gradient into electrical energy based on “Seebeck effect”. The thermoelectric power cycle, charge carriers (electrons) serving as the working fluid, follows the fundamental laws of thermodynamics and intimately resembles the power cycle of a conventional heat engine. One potential solution is the usage of the exhaust waste heat of combustion engines. This is possible by the waste heat recovery using thermoelectric generator. Thermoelectric generator converts the temperature gradient into useful voltage that can used for providing power for auxiliary systems such as air conditioner and minor car electronics. Even it can reduce the size of the alternator that consumes shaft power. If approximately 6% of exhaust heat could be converted into electrical power, it will save approximately same quantity of driving energy. It will be possible to reduce fuel also. For example, the heat of the car's exhaust can be used to warm the engine coolant to keep the engine running warm, even when the motor has been turned off for a significant length of time. A vehicle's exhaust can actually be used to generate electricity. Although these technologies can be used in any car, truck or SUV with an internal combustion engine, they are particularly important to hybrid vehicles, which need to produce maximum fuel efficiency. About 35% of the fuel is converted to useful crankshaft work, and about 30% energy is expelled with the exhaust. This leaves about one third of the total energy that must be transmit from the enclosed cylinder through the cylinder walls and head to the surrounding atmosphere.

A. Project Planning

Project planning is the process of documenting steps for accomplishing a goal within a certain time of frame, so before any process, planning is a first work to be done to accomplish that project effectively. we ensure the best use of resources, every project is based on resources including budget work space and time. It is impossible to make sure on effective completion of any project without a proper planning, that helps to minimize stress, inspire confidence, drive communication, unite and focus teams, create accountability, keep deadlines on track, prevent team overload, it helps to mitigate risk and most importantly help in Productivity and profitability so it is very important to do project planning before starting any project.

B. Problem Statement

1) In today age of fuel crisis, wastage of energy produced through engines cannot be tolerated.
2) This work aims at reclaiming energy going wasted heat gases through the silencer of engines.
3) This work proposes the usage of a miniature turbine at the silencer outlet to produce electricity.

C. Waste Energy Recovery

Waste heat from the exhaust gas from the vehicle account for a considerable portion of the fuel energy is not about 40%. A mean to improve to the fuel economy is to increase the overall efficiency of the power train by recovering waste heat from the exhaust gas of the vehicle. According to "1999 Bosch automotive electric and electronics hand book" the average electrical power consumption of an automobile is about 600 watts. This load is carried by an in efficient engine/alternator system.

D. Means for Improving Fuel Economy

Engine that burn petrol or diesel fuel propel almost all passenger car and light duty trucks. A schematic of the energy budget for a gasoline fueled internal combustion engine vehicle is shown in figure (1.1) about 70% of the available energy in the fuel is rejected as heat in the exhaust and coolant. The remainder transformed into mechanical energy or work. Some of the work used to overcome frictional losses in the transmission and other parts of the drive train and to operate the vehicle accessories (alternator, coolant pump, fuel pump etc.). As a result, only about 20 to 25% of the original energy contained in the fuel is actually used to propel the vehicle. This propulsion energy overcomes the intercooler when accelerating or climbing hills, the aerodynamic drag, and the rolling resistance of the tires on the road. Consequently, there are two general ways to reduce vehicle fuel consumption; increase the overall efficiency of the power train (engine, transmission, final drive) in order to deliver more work from the fuel consumed and reduce the require work (weight, aerodynamics, rolling resistance and accessory load) to propel the vehicle.

II. LITERATURE REVIEW

Impha Y D1, Mahammad Yunus C2, Ajaygan K2, Mustaqeem Raza2, Mohammed Imran2, Harsha Raj
Power Generation from Exhaust Gas of an IC Engine

In this project, we modify a stationary diesel engine for producing power using turbine. Nowadays in automobile field many new innovating concepts are being developed. We are using the power from vehicle exhaust to generate the electricity which can be stored in battery for the later consumption. In this project, we are demonstrating a concept of generating power in a stationary multiple cylinder diesel engine by the usage of turbines. Here we are placing a turbine in the path of exhaust in the silencer. The turbine is connected to a dynamo, which is used to generate power. Depending upon the airflow the turbine will start rotating, and then the dynamo will also start to rotate. A dynamo is a device which is used to convert the kinetic energy into electrical energy. The generated power is stored to the battery. It can be stored in the battery after rectification. The rectified voltage can be inverted and can be used in various forms of utilities

Shaikh Mobin A.1, Shaikh Saif A.2, Shaikh Najim N.3, Pathan Umar Farooq O.4, Pathan Farhan A.5
Utilization of Exhaust Gas of Vehicle for Electricity Generation

Energy means capacity to do work. There are various types of energy available in the environment which is made by conventional and non conventional energy sources. The all forms of energies are required for doing various mechanical operations, but now there is large problem of electricity due to low availability energy resources. So in villages there is no maximum electric supply for doing simple operations such as mobile charging power for lamps etc. By taking above factors we made the model which can produces electric power by using kinetic energy of exhaust gas of vehicle specially by two wheelers. When the model is in working condition, the runner rotates due kinetic energy of exhaust gas. This runner is attach to large gear by using shaft which further attach to small gear, placed on dynamo finally dynamo produces electric power. This is simple in construction due to it made by local available material.

Sharad Chandra Rajpoot Govind Mishra Uday Sahu Ravi Singh Manser Sumit Singh Rajput
Analysis of Power Generation from Exhaust Gas on 4 Stroke 4 Cylinder Petrol Engine using Thermoelectric Generator

Currently, a great deal of the automotive industry's R&D effort is focused on improving overall vehicle efficiency. Almost every type of internal combustion engine work on the principle of heat engine. It converts the chemical energy into thermal energy and in the form of pressure of air carrying the heat, piston movement is done. Traditionally, only 25 to 30% of energy is begin utilized to run the vehicle and accessories mounted on the engine and left amount of energy is wasted in various ways likes in the form of exhaust and cooling of engine component. The useful engine is used to run the engine as well as generator. So the efficiency of

those engine was very low. But one method to improve the efficiency is to develop methods to utilize waste heat that is usually wasted. One of the promising technology that was found to be useful for this purpose were thermoelectric generator. Therefore, this project involved making a bench type, proof of concept model of power production by thermoelectric generator and heat from exhaust emission of engine. In this study we investigated the use of thermoelectric generator for power production. The output energy checked by increasing of cylinder one by the help of morsh test. Power develop on the engine is checked by the morsh test. Thermoelectric generator so to impart stream of exhaust gas on surface of it and to generate small electric D.C. type of current developing upon temperature difference across intercooler or heat exchanger is installed in path of exhaust gas on seebeck effect. An output Voltage of 200mV was generated using a single Bi2Te3 thermoelectric module for a temperature difference of about 40o C. So can be able to change battery, tail lamp, head lamp, parking light, door light, indicator lump, G.P.S. system, night vision camera etc. So as to reduce frictional power against alternator can save fuel and also in automotive industry to increase the efficiency of engine

Vijay Krishna.N, Kanish Kumar, Mayukh Nemani*

Power Generation from Exhaust Gas of Single Cylinder Four Stroke Diesel Engine Using Thermoelectric Generator

utilized further for power generation. The related problems of global warming and dwindling fossil fuel supplies has led to improving the efficiency of any industrial process being a priority. One method to improve the efficiency is to develop methods to utilize waste heat that is usually wasted. One of the promising technologies that was found to be useful for this purpose were thermoelectric generators. Therefore, this project involved making a bench type, proof of concept model of power production by thermoelectric modules and heat from the exhaust emissions of engines. The experimental results showed that temperature difference obtained and external loading had an empirical relation with the power generated. An output voltage of 200mV was generated using a single Bi2Te3 thermoelectric module for a temperature difference of about 40oC. The proposed system can be used for waste heat recovery from the industry where thermal energy is used in their daily process and also in automotive industry to increase the efficiency of engines

Venkatesh. J1, Karthik Kumar. R 2, Karthikeyan. G3, Kavin. R4, Keerthi raja S.V.G

Generating Electricity by Using Exhaust Gas

There are many innovative methods for generating electricity. This project defines how we can generate electricity using exhaust gas. The turbine and dynamometer are used in this project. Dynamo is connected to the turbine which is used to generate power. The turbine is placed in the exhaust path of the silencer. The generated power differs, depending upon the airflow in the exhaust path. The dynamo starts to rotate using turbine and converts kinetic energy into electrical energy. The battery stores the generated power. The voltage has to be inverted, to be used in the equipment's. We can use the stored power depending upon our comfort

III.CONSTRUCTION

The frame for housing an engine is fabricated with the help of square tubes and channels by metal cutting and metal joining process called welding. Frame arrangement also houses the wheel setup which is directly coupled to the engine crank wheel with the help of chain drive. The fan with generator arrangement is placed at the exhaust passage of the silencer, this generator is coupled to the battery for power storage.

IV. METHODOLOGY

A. Processing Steps

1) When the engine was started, exhaust gas starts flowing through the nozzle.
2) The nozzle is place so that the gases fall directly on the turbine blades.
3) The turbine which is coupled to a dynamo starts rotating and power is generated in the dynamo.
4) The power generated may be stored in a battery of further use.

V. WORKING PRINCIPLE

Whenever the engine get kick started it starts drives the wheel, engine working emits the exhaust gas through the silencer to the atmosphere. The emitted gas hits on the blades of fan which creates linear force on the blades. This makes the fan to rotate about its axis. This rotation gets transferred to the generator which get attached with it, which converts mechanical energy (rotation) to the electrical energy which is stored with the help of battery for future purpose.

Figure :1 Working Model

VI. CONCLUSION

From this project, it has been identified that there are large potentials of energy savings through the use of waste heat recovery technologies. Waste heat recovery entails capturing and reusing the waste heat from internal combustion engine and using it for heating or generating mechanical or electrical work. It would also help to recognize the improvement in performance and emissions of the engine if these technologies were adopted by the automotive manufacturers. The study also identified the potentials of the technologies when incorporated with other devices to maximize potential energy efficiency of the vehicles. The project carried out by us made an attempt to generate electricity in engine exhaust unit. This project has also reduced the cost involved in the concern.

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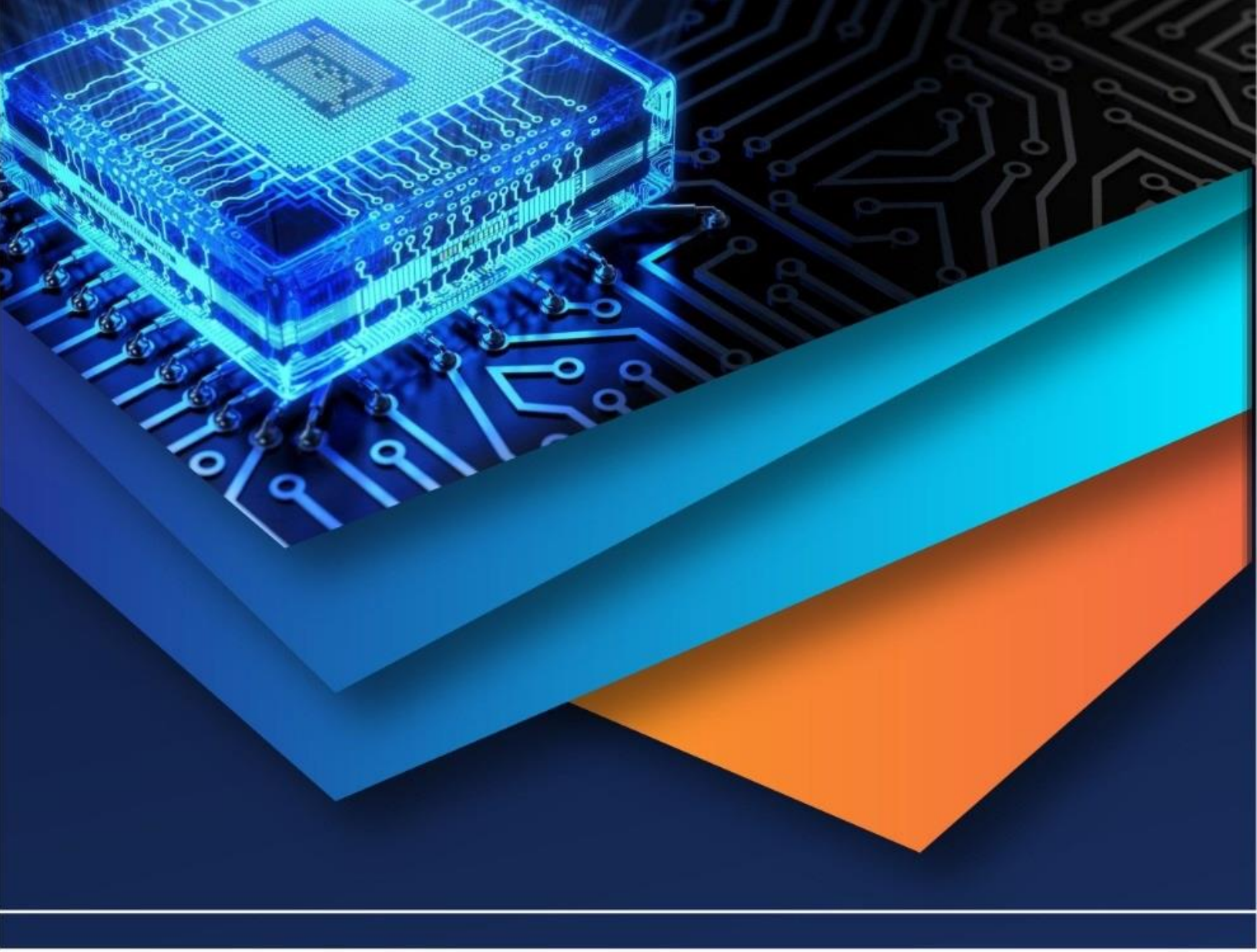

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