

A Review on Utilization of Exhaust Emission of Automobiles for Power Generation

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Abstract— Environmental problems in previous years have given rise to global warming acid rain and climate change. Power generation techniques have played a major role in disturbing the equilibrium of environment. This problem has led the researcher to think about new sources of power generation as well as the energy management in vehicles. We are facing a very serious and upcoming threat, the lack of natural resources either fuel since we can't generate a new energy resource but we can reuse or recycle the energy resources. Here in this study of electrical power generation we are trying to explore the primary techniques and principles behind the conversion of kinetic energy of IC engines exhaust gas to the rotary motion and by analysis presenting the charging of battery by using bike exhaust gas. The experimental investigation shows the conversion of kinetic energy of exhaust into electrical energy via mechanical energy.

Keywords: Environmental Problems, Power Generation, Natural Resources, Energy Conversion

I. INTRODUCTION

- Mechanism consists of an Aluminium turbine connected to the shaft of the generator.
- Since heat conductivity of Aluminium is high enough, it helps in achieving rapid cooling.
- For the impingement of exhaust gases over the blades of turbine, a nozzle is used which is placed in a fixture fitted in a frame of mild steel. On the opposite side of nozzle, an outlet is provided for the gases.
- With the spinning of turbine blades direct current (D.C.) is produced by the dynamo. This direct current passes through the inverter where it is converted into alternating current (A.C.).
- The required capacity of dynamo, considering its size and weight, would be 12V, 5A.
- The AC is passed through an Inverter to convert it into DC, which would be stored in a DC rechargeable battery of matching capacity (12V, 5A).

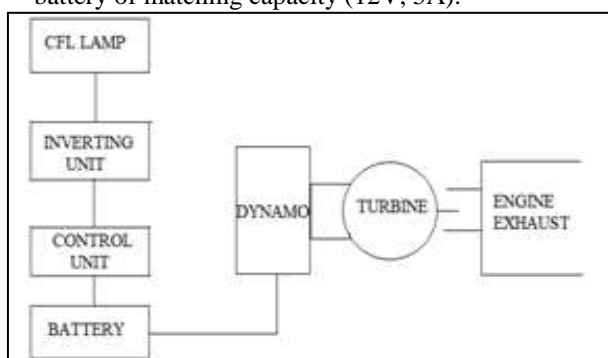


Fig 1. Power conversion mechanism

Figure 1 shows the schematic diagram of a power conversion mechanism.

II. CONVERSION OF KINETIC ENERGY INTO ROTATIONAL ENERGY

The basic principle of working is the conversion of kinetic energy coming out of exhaust gases of vehicle into the rotational energy. The speed of rotation of the shaft through which the electricity is to be made by dynamo is proportional to the velocity of the exhaust coming out of the vehicle. Higher the velocity of the exhaust gases higher is the speed of rotation of the turbine and hence electricity generation takes place in same proportion.

$$\text{Swept area } A = \pi \times R^2$$

Where R is the radius of the turbine

$$\text{Velocity of the Turbine} = (\pi \times D \times N) / 60$$

Where,

D=diameter of turbine

N=number of revolution per minute

Power at the shaft,

$$P = (1/2) \times \text{Density} \times (\text{Velocity})^3 \times C_p \times \text{Area}$$

III. VARIOUS DESIGN MODELS



Fig. 2: model of bike using energy generation from exhaust gases

The model of a bike is shown in figure-2 where the equipment for converting energy of exhaust gases to rotational energy for power generation is fitted at the downstream side of the vehicle.



Fig. 3: power generation equipment

Similarly another model of a motor bike is shown in figure-3 where power generation model is fitted near the exhaust side of the vehicle.

IV. FUTURE PROSPECTS

Power generation through exhaust of vehicles has a large scope for research. Since in near future sources of power generation will be limited, eco friendly automobiles will play a big role under those circumstances. In the future we can improve and work on this project to make it much more effective and efficient. Some of the future aspects of our project are:

- In coming future this idea of power generation can be implemented in industry where it would be proven as a good energy savior.
- It can be applied on residential and commercial both types of generators which can help in enlighten small equipments near by the system.
- It can be used to charge the mobile phones while in long journey where battery gets discharged and we have no other option for charging.
- It can be used to light LED and CFL bulbs in which a little quantity of power is required.

V. CONCLUSION

Limited resources of fuel have given rise to the generation of power from alternate resources. Power generation from exhaust of vehicles is one of the major effort in this direction. Since we are focusing on the reutilization of wastage coming as exhaust of vehicles, we need a source of energy. The exhaust of vehicle contains enough amount of energy which is capable to generate electricity either to charge a battery of vehicle, to charge a phone, to enlighten a CFL, to enlighten a LED, since that energy is getting wasted by direct emission in atmosphere. This system can be modified and implemented onto large scale industries for power saving.

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