

Alternatively Electricity Generation in an Automobile An Alternative Fuel

Er. Sumit Prasad, Er. Subodh Prasad and Er. Ashis Saxena

Abstract- Need for this paper arises because of the scarcity of the crude-oil resources in our mother nature for satisfying our multiplying demands. This paper draws the prime attention of the authors to develop an alternative mechanism, which can serve as a basis for driving the automobile. The traditional system, which is a reciprocating engine driven by petroleum products, can be replaced by an electric motor generating same rating of power equivalent to engine. In this system reciprocating engine is replaced by an electric motor (1hp engine \approx 746 watt of motor), which will perform the electric work instead of mechanical work for generating torque required for running the vehicle. Since, there is a continuous requirement of electricity for running this motor, we need a power source which can store electricity for a longer duration, for which the automobile wants to be drive. This is having a limitation which is that, the stored electricity can run for a specific duration depending upon the power source, so we require an alternative which can serve as a basis for continues generation of electricity within the working cycle of the electric motor. Technique used here for the generation of electricity is based on low cost and easily available sources, which are wind energy and solar energy. These two techniques on using in a smarter and aggregate manner can generate sufficient amount of electricity required to run the electric motor, and if required can charge the storing source of electricity i.e. battery.

Keywords- Reciprocating Engine, Electric Motor, Rotor.

Introduction

Coping-up with the biggest crises for human-kind which is, *energy crises*, is always being a challenge. Hundred of techniques and technologies are developed which can take the place of present automotive fuel or can be the future shape of the automobile, but is it really a cheap alternative. This system is also an effort of the authors among all those practices which are taking place in this century to face the future energy crises.

Er. Sumit Prasad, Department of Management Studies, Bhimtal, Uttarakhand- India

E-mail: sumitprasad_coer85@yahoo.co.in

Er. Subodh Prasad, Assistant Professor, Amrapali Institute of Technology and Sciences, Uttarakhand – India, E-mail: subodhprasadgbpuat@gmail.com

Er. Ashis Saxena, Assistant Professor,

Amrapali Institute of Technology and Sciences, Uttarakhand – India, E-mail: erashis@gmail.com ;

Concept for the system is to use an electric motor instead of reciprocating engine, for generating the torque required by the vehicle to drive it. This electric motor is of same rated power as it is of the reciprocating engine, and can solve the desired purpose sufficiently. Since, this concept sounds very easy and effecting then why cant we implement it, because alike to the traditional reciprocating engine system in electric motor engine system we also need a reservoir, which can store current, required by the motor to drive the vehicle. We have batteries for that, an easy solution, but how long can a battery run such a motor. This leads to a limitation of charging the battery again and again for driving the vehicle continuously, like we have to fill our vehicles fuel tank today.

What happen if we can produce electricity with in the vehicle, which can easily provide a continuous current to the electrical motor and at the same time can charge the battery, if needed be?

Answer to the question lies in this research work, the authors has designed a prototype of such a system which can generates electricity while the vehicle is moving. The sources here used for doing so are wind energy and solar energy. A prototype is designed consisting of rotors and solar panel, which can be mounted on the roof top of the vehicle generating electricity while the vehicle is moving. Rotors blades are designed in such a manner so that they can capture maximum amount of air flowing above the roof-top of the vehicle, when air blows perpendicular to them.

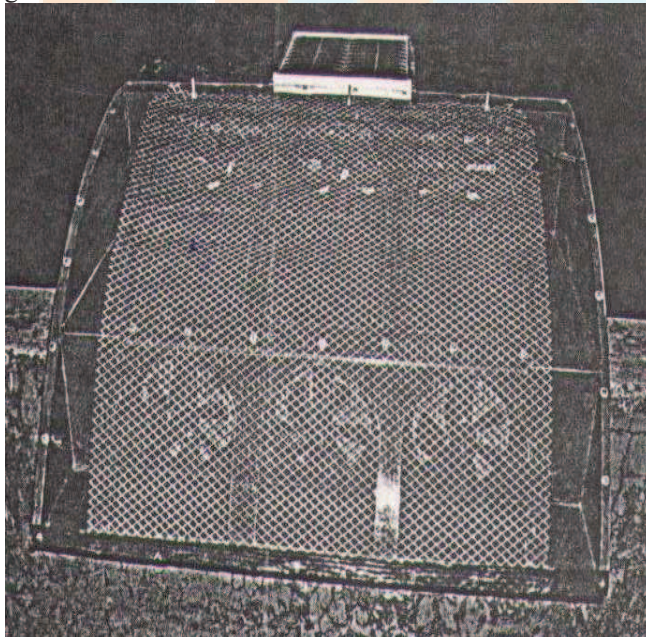
De-limitation of the Project:

1. It is just a prototype which has limited capacity for electricity generation.
2. It is impossible to inbuilt the system with in the vehicle, so the system is designed as an accessory which is mounted additionally on the top of the vehicle, and all the calculation are done on that basis.

Working of the Prototype:

The assembly is mounted on the roof top of Maruti 800. The prototype was designed to trap maximum wind speed and convert it into electricity by using simple wind rotors and dynamo. The assembly is comprises of Rotors and Solar Panel, which serve the purpose of generation of electricity in dual mode, from wind energy and solar energy.

At the time, when the vehicle is in standing mode, the initial charge is provided by the electricity stored in the mass storage i.e. battery. Later on when the vehicle is in running mode, maximum air is trapped in the air rotors and electricity is generated. The rotor blades are in direct contact with the wind flowing above the roof of the vehicle, which tends to rotate the blades of the prototype. When the blades are rotated the dynamo connected to the blades also rotates and generates electricity. For increasing the total wattage of the assembly the numbers of rotors are increased to six and hence totality of the generated power increased. On the other hand we have an additional supporting assembly to increase the amperage generated.



Design of Prototype

Application and Advantage of the System:

This system can be a basis for designing of the future of the automobiles, as this system can obsolete the requirement of petroleum.

- It reduces the harmful emission into air, i.e. less air pollution.
- No tension of refilling the fuel tank.

- Solar and wind energy are free of cost and can highly reduced running cost.
- Less maintenance cost.
- No need to stop and recharge the batteries of the vehicle.

Main Aspect of the Project:

- Project is based on the utilization of Solar using solar panel and Wind energy using wind energy rotors.
- The prototype is to be mounted on the roof top of a car as it is mainly designed keeping in mind the roof top Maruti-800.
- Blades of rotor is so designed, so that it can trap maximum amount of air, perpendicular it them.
- All the rotors are connected in parallel to increase the amperage.

System Architecture:

The functional prototype is based on the utilizing of solar and wind energy, consisting of solar panel and rotors for capturing solar and wind energy respectively.

- **Six Rotors** connected with **Dynamos** arrangement connected in parallel circuit, 1-36 volt and 12000 rpm rating. The Rotors tested in a wind velocity of 70km/hr given an output of 30 volt.
- **Solar Panel** of 5 watt capacity and 12 volt rating to convert the sunlight into electrical energy. They have been tested in sunlight and it gives an output of approximately 14 volt.

Amount of Power Generated By the System:

Total power generated by the system is a composition of 'Power generated by Solar Panel' and 'power generated by Wind Rotors'. As:

1. Power generated by Solar Panel:

*'Total watt per day = Solar panel size * Peak sun hours * Number of Solar Panel'*

Solar Panel size = 5 watt.

Peak sun hours in a day = 5 hours.

Number of Panel used = 01.

Total watt produced per day = 5 * 5 * 1 = 25 watt per day.

2. Power generated by Wind Rotors Dynamos can be calculated as:

$$\text{Power} = \frac{1}{2} * \rho * A * V^3$$

ρ = Density of Air = 1 kg/ m³

A = Swept Rotor Area in square meter.

$$A = 3.14 * (0.14)^2 / 4 = 0.0154 \text{ m}^2$$

D= Diameter of rotor Blade= 0.14 meter

V = Wind speed in meter/sec.

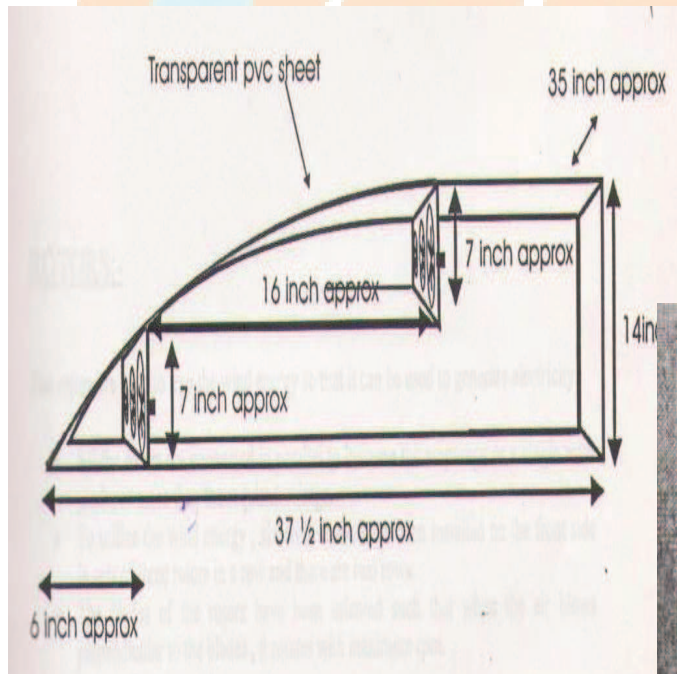
$$V = 70 \text{ km/hr} = 17.44 \text{ m/s.}$$

$$\text{Power} = \frac{1}{2} * 1 * 0.0154 * 17.44^3 = 40.85 \text{ watt}$$

Constructional Details:

The main components of the prototype are:

1. Rotors.
2. Dynamo.
3. Solar Panel.



Dimension of Prototype

Dimension of the Prototype:

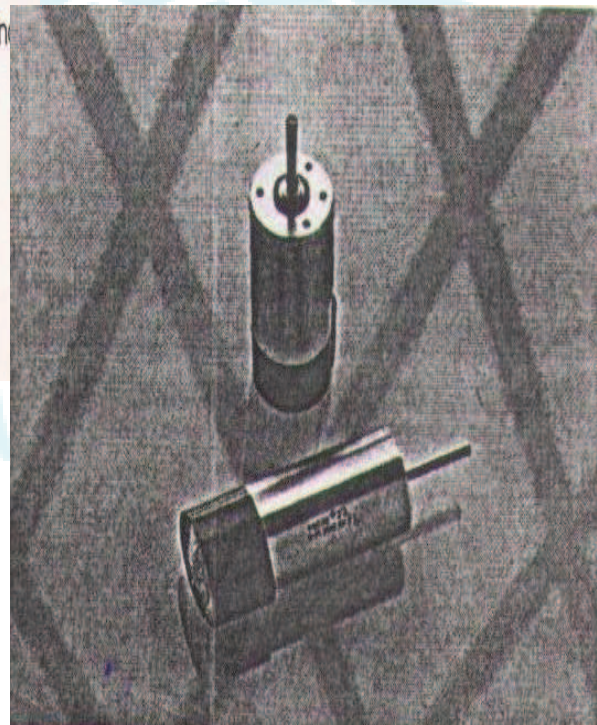
- Base is 37.5 inches length.
- Height is 14 inches.
- There are Six Rotors.
- Each row contains 3 rotors.
- Each rotor has six blades.
- First set of blades are fixed at a distance of about 6 inches.
- Second set of blades are fixed at a distance of about 16 inches from the first set of blades.
- Width of the model is approx. 35 inches.

- The front side of the model is covered with transparent PVC sheet.
- The solar panel is fixed on the top of the model.

1. Rotors: They are used to trap the wind energy so that it can be used to generate electricity.

- a. All the rotors are connected in parallel to increase the amperage.
- b. To utilise the wind energy, six rotors have been installed on the front side in set of three rotors in a row and there are two rows.
- c. The blades of the rotors have been oriented such that when the air blows perpendicular to the blades, it rotates with maximum speed.

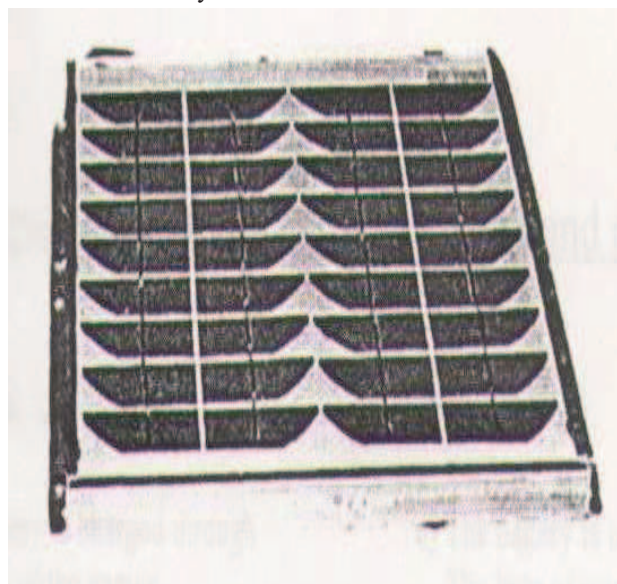
2. Dynamo: They are used to convert the alternative current (a.c.) into direct current (d.c.) so as to charge the battery for storing the electricity in the vehicle. Picture as Below.



- a. It is a swiss made dynamo.
- b. Rating of 1-36 volts and 12000 rpm.
- c. The outer casing has a length of 60 mm and diameter of 23 mm.

- d. The rotor shaft has a length of 20 mm and diameter of 3 mm.

3. **Solar Panel:** It is used to trap the solar energy for incensing the generation of electricity. Picture as Below.



- a. The solar panel has a total of 18 cells.
- b. Size of solar panel is 1 feet.
- c. Capacity is 5 watt and 12 volt rating.
- d. It produces D.C.
- e. It sis made up of silicon material.

Comparison between Existing System and Proposed System:

S.No.	Existing System	Proposed System
1	Electricity is generated through the crank-shaft coupled with alternator.	Electricity will be generated with the help of solar and wind energy
2	The fuel used here is petroleum	Fuel is Solar or Wind energy
3	Initial cost is low.	Initial cost is high
4	It consumes 5-10 % of the energy produced by the	It directly does not consumes the energy produced by engine

	engine	
5	Maintenance required is high	Low maintenance required
6	Fuel economy is a major concern	It saves fuel
7	It contributes very less to the weight of the vehicle.	It is comparatively heavier.
8	It does not have any effect due to bad weather	It cannot be very effective in bad weather.

Conclusion:

Following are the conclusion drawn from the prototype:

1. **This model due to its design simplicity and working is very efficient:** The design of the prototype is pretty simple; it does not include any complexities as such. There are mainly three parts of the system, rotors, dynamo and solar panel. The circuitry is also very simple.
2. **It will help in saving fuel as it runs on renewable energy sources:** The driving force here is solar energy and wind energy, which are non-conventional sources of energy and are available in abundance and free of cost.
3. **It helps in cost reduction:** This prototype has got one time investment in the beginning and its maintenance from time to time is negligible.
4. This can be further improved by in building the system with the chassis of the vehicle.
5. By increasing the number of rotors and high wattage solar panel we can increase the amount of power generated by the system and can store the energy for driving the vehicle.

References:

1. Gupta, K. M., Automobile Engineering, Vol. II, Umesh Publication, 2001.