Study and Analysis of Power Generation by Speed Breaker-A Review

Omkar Kalbhor¹ Prof. J.V.Chopade²
1,2Pimpri Chinchwad College of Engineering and Research, Ravet, Pune, India

Abstract— Electricity plays a very important role in our life. Due to population explosion, the current power generation has become insufficient to fulfill our requirements. To overcome this problem we need to implement the techniques of optimal utilization of conventional sources for conservation of energy. We can utilize the energy which is wasted when the vehicles passes over a speed breaker. Lots of energy is generated when vehicle passes over it. We can tap the energy generated and produce power by using the speed breaker as power generating unit. The kinetic energy of the moving vehicles can be converted into mechanical energy of the shaft through rack and pinion mechanism. Then, this mechanical energy will be converted to electrical energy using generator which will be saved with the use of a battery. The energy we save during the day light can be used in the night time for lighting street lights. In coming days, this will prove a great boon to the world, since it will save a lot of electricity of power plants that gets wasted in illuminating the street lights.

Key words: Kinetic energy, Speed breaker, Electro-Mechanical unit, Non-conventional energy

I. INTRODUCTION

Increasing demand of energy adds to the need of identifying non-conventional resources of energy. In my paper, I will discuss about power generation from speed breaker and the possible mechanism required for it. Nowadays renewable energy and energy recovery are considered the most efficient strategies to reduce the financial and environmental drawbacks of the excessive utilization of fossil fuel. Nonetheless, most of the investigations have been paying attention on solar energy, wind energy and wave energy. On other hand, the operational mode of many of the utilized systems is not sufficiently optimized. This strongly states that high amounts of energy are still wasted and may be recovered. Energy can be recovered from several existing systems such as combustion systems where the exhaust gas energy can be recovered and utilized in several applications. Furthermore, the heat rejected from condensers can also be utilized as heat sources. Without a doubt many applications may be regarded as energy source. The energy crisis is a bottleneck in the supply of energy resources to an economy. The studies to sort out the energy crisis led to the idea of generating power using speed breaker. First to make use were South African people, their electrical crisis has made them to implement this method to light up small villages of the highway. The idea of basic physics to convert the kinetic energy into electrical energy that goes waste when the vehicle runs over the speed-break was used. Since then a lot has been done in this field. The idea caught our working team and we have decided to develop such a project that will produce more power and store it for use at night time as it proves to be a boon to the economy of the country.[1-25]

- Our project is based on future demand and future demand is electricity .By using some research paper which have been published by expert, we implement the rack and pinion mechanism in our project.
- Rack and pinion mechanism provides more efficiency than other mechanism like roller, crank and shaft etc.
- In this world where there is shortage of electrical power supply, this project will be helpful to solve the power crisis to some extent. This project has some advantages such as; it is economical and easy to install, free from all types of pollutions well as maintenance cost is low .Speed breaker power generator prototypes have been designed, built and experimentally tested. The generator relies on the use of different gear combination to harness power from the speed breaker. This concept is quite promising due to its good efficiency as well as energy recovery criteria.

II. BLOCK DIAGRAM

III. EQUIPMENT REQUIRED

A. Rack and Pinion Gears
The rack and pinion used to convert between rotary and translatory motion. The rack is the flat toothed part, while the pinion is the gear. Rack and pinion can convert rotary to linear of from linear to rotary motion.

B. Ball Bearings
A roller-element bearing is a bearing which carries a load by placing round elements between the two pieces. The relative motion of the pieces causes the round elements to roll(tumble) with little sliding. They reduce the friction and transmit the motion effectively.

C. Spur Gear
It is a positive power transmission device with definite velocity ratio. It is preferred for adjusting some linear misalignment. It should have high wear and tear, shock-absorbing capacity.
D. Flywheel
The primary function of flywheel is to act as an energy accumulator. It reduces the fluctuations in speed[9]. It absorbs the energy when demand is less and releases the same when it is required.

E. Shaft
It is a rotating element, which is used to transmit power from one place to another place. It supports the rotating elements like gears and flywheels. It must have high torsional rigidity and lateral rigidity.

F. Generator
It is a device, which converts mechanical energy into electrical energy. The generator uses rotating coils of wire and magnetic fields to convert mechanical rotation into a pulsing direct electric current through “Faraday’s law of electromagnetic induction”.[1-26]

IV. CONSTRUCTIONAL DETAILS

A. Schematic Diagram

![Schematic Diagram](image)

Table 1: Voltage generated VS Speed of vehicle

<table>
<thead>
<tr>
<th>Sr no.</th>
<th>Load(kg) of vehicle</th>
<th>Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>360</td>
<td>8.33</td>
</tr>
<tr>
<td>2</td>
<td>430</td>
<td>9.57</td>
</tr>
<tr>
<td>3</td>
<td>470</td>
<td>10.44</td>
</tr>
<tr>
<td>4</td>
<td>500</td>
<td>11.34</td>
</tr>
</tbody>
</table>

Table 2: Voltage generated VS load of vehicle

Whenever the vehicle is allowed to pass over the dome it gets pressed downwards, then the springs that are attached to the dome are compressed and the rack, which is attached to the bottom of the dome moves downward in reciprocating motion. Since the rack has teeth connected to gears, there exists conversion of reciprocating motion of rack into rotary motion of gears but the two gears rotate in opposite direction. A flywheel is mounted on the shaft whose function is to regulate the fluctuation in the energy and to make the energy uniform. So the shafts will rotate with certain rpm. These shafts are connected through a belt drive to the dynamos, which converts the mechanical energy into electrical energy. The conversion will be proportional to the traffic density.

Whenever an armature rotates between the magnetic fields of south and north poles, an E.M.F (electro motive force) is induced in it. So, for inducing this E.M.F. armature coil has to rotate, and for rotating this armature it is connected to a long shaft. For this rotation kinetic energy of moving vehicles is utilized. The power is generated in both the directions; so to convert this power into one direction, a special component is used, called zener diode, for continuous supply. The electrical output can be improved by arranging these POWER HUMPS in series. This generated power can be amplified and stored by using different electrical devices. The block diagram describing the whole process is shown[3]

VI. SCOPE OF PROJECT
The utilization of energy is an indication of the growth of a nation

For example, the per capita energy consumption in USA is 9000 KWh (Kilo Watt hour) per year, whereas the consumption in India is 1200 KWh (Kilo Watt hour). One might conclude that to be materially rich and prosperous, a human being needs to consume more and more energy. A recent survey on the energy consumption in India had published a pathetic report that 85,000 villages in India do not still have electricity.

Supply of power in most part of the country is poor. Hence more research and development and commercialization of technologies are needed in this field. India, unlike the top developed countries has very poor roads. Talking about a particular road itself includes a number of speed breakers. By just placing a unit like the “Power Generation Unit from Speed Breakers”, so much of energy can be tapped.

This energy can be used for the lights on the either sides of the roads and thus much power that is consumed by these lights can be utilized to send power to these villages.
VII. APPLICATIONS

Power generation using speed breaker system can be used in most of the places such as:
This technique can be used in all highways.
This technique can be used in all roadways Speed brake.
This mechanism of generating of electricity can be placed on the actual speed breaker of the roads. The power is generated when the vehicles pass through it. Which in can be stored in the battery. This power can be used in many places after using the inverter, which enhances in the voltage from 12 volts to 230 volts. This power can be used in the following:
- Street Lights.
- Road Signals.
- Sign boards on the roads.
- Lighting Of the bus stops.
- Lighting of the check post on the highways etc.[4]

VIII. ADVANTAGES

1) Power generation with low cost and using non-conventional energy sources which will help us to conserve the conventional energy sources to meet the future demand.
2) By using this method, electricity will be generated throughout the year without depending on other factors.
3) Easy for maintenance and no fuel transportation problem.
4) Pollution free power generation.
5) Less floor area required and no obstruction to traffic.
6) No need of manpower during power generation.[1]

IX. CONCLUSION

"Electricity plays a very important role in our life". Due to population explosion, the current power generation has become insufficient to fulfill our requirements. In this project we discover technology to generate electricity from speed breakers in which the system used is reliable and this technique will help conserve our natural resources. In coming days, this will prove a great boon to the world, since it will save a lot of electricity of power plants that gets wasted in illuminating the street lights. As the conventional sources are depleting very fast, it’s high time to think of alternative resources. We got to save the power gained from the conventional sources for efficient use. So this idea not only provides alternative but also adds to the economy of the country.[1] In coming days, this will prove a great boon to the world, since it will save a lot of electricity of power plants that gets wasted in illuminating the street lights. As the conventional sources are depleting very fast, then it’s time to think of alternatives. We got to save the power gained from the conventional sources for efficient use. So this idea not only provides alternative but also adds to the economy of the country. Now, vehicular traffic in big cities is more, causing a problem to human being. But this vehicular traffic can be utilized for power generation by means of new technique called “power hump”. It has advantage that it does not utilize any external source. Now the time has come to put forte these types of innovative ideas, and researches should be done to upgrade their implication.

REFERENCES

[4] Alok Kumar1 SinghDeepak2 SinghMadhawendra Kumar3 Vijay Pandit4 Prof.SurendraAgrawal5 International journal of innovations in engineering and technology