Electricity Generation from Speed Breakers

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---ABSTRACT---
Energy is the primary need for survival of all organisms in the universe. Everything what happens in the surrounding is the expression of flow of energy in one of the forms. But in this fast moving world, population is increasing day by day and the conventional energy sources are lessening. The extensive usage of energy has resulted in an energy crisis over the few years. Therefore to overcome this problem we need to implement the techniques of optimal utilization of conventional sources for conservation of energy. My paper includes how to 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. Therefore, by using this arrangement we can save lot of energy which can be used for the fulfillment of future demands

Keywords - *Electromotive force, Generator, Non-conventional energy, Speed breaker.*

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.

II. WORKING

This project explains the mechanism of electricity generation from speed breakers.[1][2][3] The vehicle load acted upon the speed breaker system is transmitted to rack and pinion arrangements. Then, reciprocating motion of the speed-breaker is converted into rotary motion using the rack and pinion arrangement where the axis of the pinion is coupled with the sprocket arrangement. The sprocket arrangement is made of two sprockets. One of the sprocket is larger in dimension than the other sprocket. Both the sprockets are connected with chain which transmits the power from the larger sprocket to the smaller sprocket. As the power is transmitted from the larger sprocket to the smaller sprocket, the speed that is available at the larger sprocket is relatively multiplied at the rotation of the smaller sprocket. The axis of the smaller sprocket is coupled to a gear arrangement. Here we have two gears with different dimensions. The gear wheel with the larger diameter is coupled to the axis of the smaller sprocket. Hence, the speed that has been increased at the smaller sprocket wheel is passed on to this gear wheel of larger diameter. The smaller gear is coupled to the larger gear. Therefore, as the larger gear rotates it increases the speed of the smaller gear which is following the larger gear and multiplies the speed to more intensity. Though the speed due to the rotary motion achieved at the larger sprocket wheel is less, as the power is transmitted to gears, the final speed achieved is high. This speed is sufficient to rotate the rotor of a generator and is fed into the rotor of a generator. [4]The rotor which rotates within a static magnetic stator cuts the magnetic flux surrounding it, thus producing the electric motive force (emf). This generated emf is then sent to an inverter, where the generated emf is regulated. This regulated emf is now sent to the storage battery where it is stored during the day time and can be used in night time for providing power to street lights.

III. LITERATURE REVIEW

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.

IV. BLOCK DIAGRAM
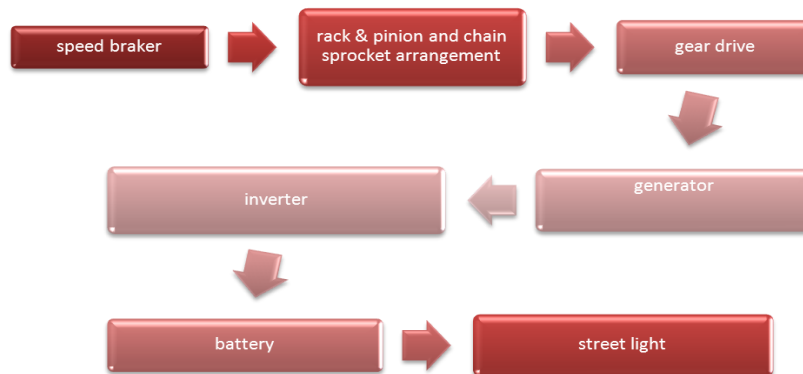
V. EQUIPMENT REQUIRED

5.1. 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 [8].

5.2. 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.

5.3. 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.

5.4. 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.

5.5. 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.

5.6 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".

VI. CONSTRUCTIONAL DETAILS
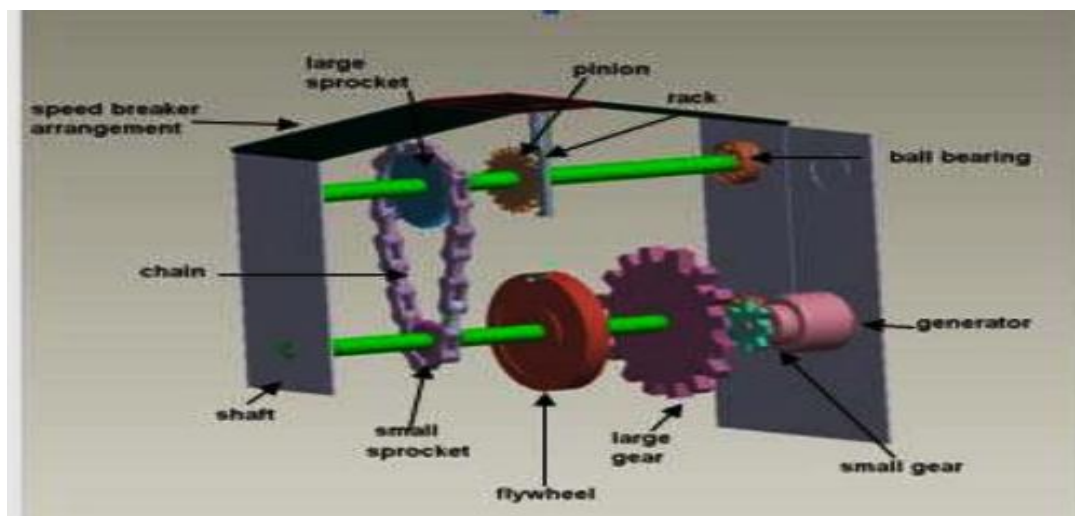
VII. POWER CALCULATIONS

Let us consider,

The mass of any vehicle travelling over the speed breaker= 300Kg (Approximately)

Height of speed brake = 15 cm

Work done = weight of the body x distance travelled by the vehicle

Here, Weight of the Body = 300 Kg x 9.81 = 2943 N

Distance traveled by the body = Height of the speed breaker = 15cm

Power = Work done/Second = (2943 x 0.15)/60 = 7.3575 Watts

Output Power developed for 1 vehicle passing over the speed

Breaker arrangement for one minute = 7.3575 watts

Power developed for 60 minutes (1 hr) = 441.45 watts

Power developed for 24 hours = 10.5948 Kw

This power generated by vehicles is more than sufficient to run four street lights in the night time.

VIII. ADVANTAGES

- 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.
- By using this method, electricity will be generated throughout the year without depending on other factors.
- Easy for maintenance and no fuel transportation problem.
- Pollution free power generation.
- Less floor area required and no obstruction to traffic.
- No need of manpower during power generation.

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.

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