

Speeders with Smarter Way to Generate Electricity

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Abstract - In the current scenario demand of power is increasing day by day with increasing population. on the other hand, energy crisis is also a main issue of today's life and all there is a shortage of convectional energy resources due to its large usage, so we have to sort out this problem with technique which will not only overcome this energy crisis but also should be eco-friendly. Mainly convectional resources are creating pollution so that's why focus is towards eco-friendly solutions. This project emphasizes on idea which shows that power could be generated by specially designed humps. A large of kinetic energy is being wasted on road on daily basis in different forms which could be used to generate power and this power can be stored in batteries. This project shows clearly how we can generate power by using rack and pinion mechanism. Where basically linear motion is converted into rotary motion and then can be used to generate electricity. Large amount of electricity can be generated by using this method and this method is eco- friendly.

Key Words: energy crisis, kinetic energy, power production, speed humps.

1. INTRODUCTION

We know that the kinetic energy can be converted to electrical energy. We are presenting in this paper that kinetic energy produced by movement of vehicles on speed breaker of road, convert in electrical energy i.e., can produce power. Here in this paper we are looking forward to conserve the kinetic energy that gone wasted, while vehicles move. The number of vehicles passing over speed breaker on road is increasing day by day. Beneath speed breaker, setting up an electro-mechanical unit known to be power hump, could help us conserving this energy and use it for power generation. The electrical output can be improved by arranging these power humps in series. This generated power can be stored, by using different electrical devices. We can supply this energy to street lights, traffic lights and nearby areas and thus helps in country economy by also having solar panels that can provide power when needed while the vehicles were not moving.

2. BASIC PRINCIPLE

When moving, the vehicles possess some kinetic energy. This kinetic energy can be utilized to produce power by using a special arrangement called POWER HUMP. It is an Electro-Mechanical unit. It utilizes both mechanical technologies and electrical techniques for the power generation and its storage. POWER HUMP is a dome like device likely to be speed breaker. Whenever the vehicle is allowed to pass over the dome it gets pressed down-wards then the springs are attached to the dome is 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 energy to make the energy uniform. So that the shaft will rotates with certain R.P.M 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 traffic density. Whenever the armature rotates between the magnetic field south and north poles, an EMF is induced in it. So, for inducing th EMF armature coil has to rotates, for rotating this armature it is connected to along shaft. By rotating same EMF is induced, for this rotation kinetic energy of moving vehicles is utilized. All the mechanism can be housed under the dome. Like speed breaker which is called HUMP. The electricity output can be improved by arranging these power humps in series. This generated power can be amplified and stored by using different electrical devices.

A. Possible using different mechanisms:-

1. Spring coil mechanism
2. Rack-pinion mechanism
3. Crank-shaft mechanism
4. Roller mechanism

3. WORKING PROCEDURE

Speed breaker POWER GENERATOR converts basically new concept of non-conventional energy generation. It is electro mechanical energy generating machine. This machine converts reciprocating motion into rotary motion. The rotational power is stored in flywheel rotates dynamo which generates power electricity

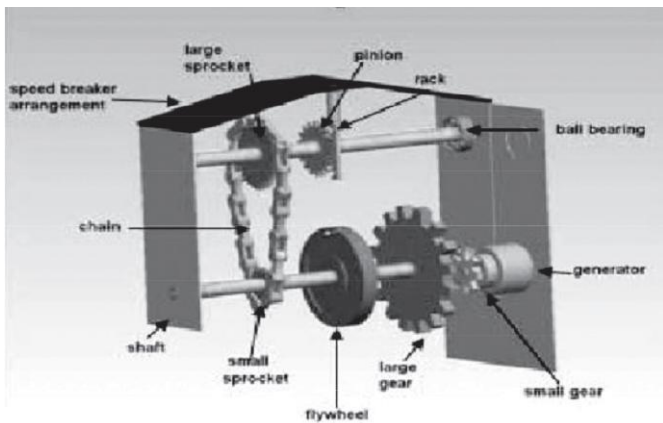


Fig -1: Rack and pinion mechanism

Here first important point is how we get reciprocating motion, which is prime input in the system. For that we use weight of moving vehicle on the speed breaker. We put our machine underneath the speed breaker installing different units. All the units are connected to the common shafts using chain and sprocket drive. The head of rack is brought up to level beneath the speed breaker surface. When vehicle moves on the speed breaker, the rack will be pushed down the rack is attached to it's with free wheel type pinion that rotates in one direction only. The rack and pinion arrangement convert reciprocating motion into rotary motion. This rotary motion is further magnified using reciprocating motion into rotary motion belt and pulley drive. The output of pulley is attached with flywheel which stores kinetic energy and transfer to dynamo which electricity with zero cost. A generator and motor is essentially the same thing; what we called it depends on whether electricity is going into the unit or coming out of it. A generator produces electricity. In a generator, something causes the shaft and armature to spring. This generated power is used for various application required by different user.

3.1 BLOCK DIAGRAM ARRANGEMENT

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.

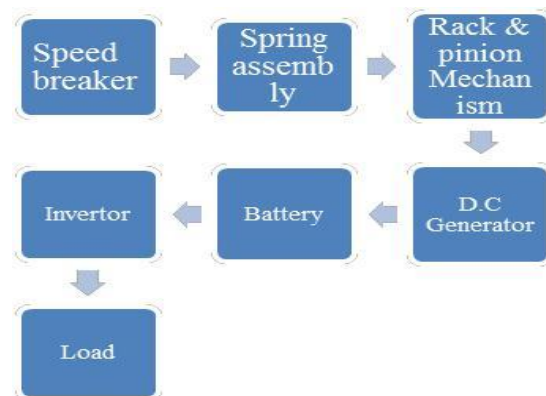


Fig -2: Block diagram of system

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 in Fig.2.

4.FLOW CHART

By using the algorithm the user can easily understand the flow of power generation using speed breaker.



Fig -3: Flow chart of power generation

The working is start from speed breaker when the vehicle is passing over the dome like structure that creates the force on the spring assembly. Because of that rack and pinion mechanism work i.e. conversion of linear motion to rotary motion and vice versa. After that the dc generator is used for conversion of mechanical energy to electrical energy.

4.1 SPECIFICATIONS OF THE COMPONENTS

SI.no	COMPONENT	SPECIFICATIONS
1.	Rack	37 teeth, Mild steel, Total length 355.6mm
2.	Spring	Yamaha front shock spring
3.	Shaft	Diameter -25mm, Length-304.8mm,
4.	Pinion (small gear)	Teeth-24, External diameter-71mm, Internal diameter-53mm.
5.	Large Gear	Teeth-110, External diameter-257mm, Internal diameter-225mm
6.	Ball bearing	Type 6205
7.	Flywheel	Weight-15.3kg, Diameter-250mm, Thickness 38.1mm.
8.	Chain sprocket	3 chain sprocket for 3 dynamos.

Fig -4: specifications of components

5. RESULTS AND POWER CALCULATIONS

Let us consider,
 The mass of a vehicle moving over the speed breaker =250kg (Approximately)
 Height of speed brake =10 cm
 Work done=Force x Distance
 Here,
 Force=Weight of the Body
 =250 kg x 9.81
 =2452.5 N
 Distance traveled by the body = Height of the speed brake=10 m
 Output power=Work done/Sec
 = (2452.5 x 0.10)/60
 4.0875 Watts (For One pushing force)
 Power developed for 1 vehicle passing over the speed Breaker arrangement for one minute= 4.0875 watts
 Power developed for 60 minutes (1 hr) =245.25 watts
 Power developed for 24 hours=5.866 kW
 This power is sufficient to burn four street lights in the Roads in the night time.

Table -1: LOAD VS VOLTAGE GENERATED

SI.no	Load (kg)	Voltage generated(v)
1.	130	9.45
2.	170	10.22
3.	200	11.23
4.	270	11.81

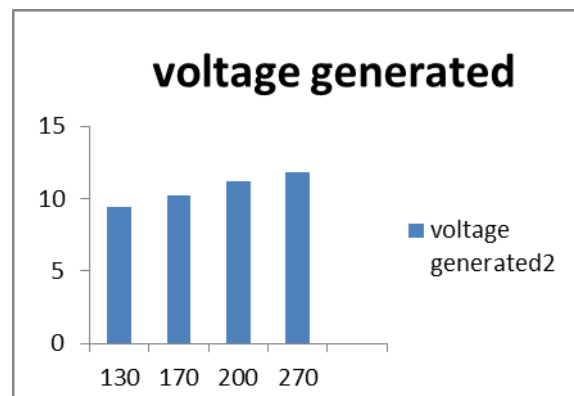


Fig -5: Load vs voltage generated

Table -2: SPEED VS VOLTAGE GENERATED

SI no	Vehicle speed (km/ hr)	Voltage generated(volts)
1.	10	7.93
2.	20	6.28
3.	30	5.03
4.	40	4.66
5.	50	3.03

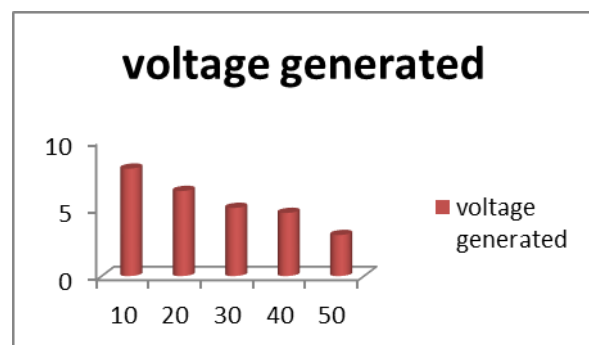


Fig -6: Speed vs voltage generated

6. ADVANTAGES

Below is the list of advantages due to the usage of the technique mentioned in this paper.

- a. Pollution free power generation.
- b. Simple construction, mature technology and easy maintenance.
- c. No consumption of any fossil fuel which is non-renewable source of energy.
- d. No fuel transportation required.
- e. No external source is needed for power generation. Energy available all year round.

7. CONCLUDING REMARKS

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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