Power Generation by Kinetic Energy of Speed Breaker

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ABSTRACT

In the present days power has got a major importance in human life. Due to day by day increase in population and less of the conventional sources; it becomes necessary that we must depend on non-conventional sources for power generation. While moving, the vehicles posses some kinetic energy and it is being wasted. This energy can be utilized to produce power by using a special arrangement called “POWER HUMP”.

Keywords: POWER HUMP, POWER GENERATOR

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 power, when needed while the vehicles were not moving.

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 downwards 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 the energy and to make the energy uniform. So that the shafts will rotate 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 an armature rotates between the magnetic fields of south and north poles, an E.M.F is induced in it. So, for inducing the E.M.F., armature coil has to rotate, for rotating this armature it is connected to a long shaft. By rotating same e.m.f is induced, for this rotation kinetic energy of moving vehicles is utilized. The power is generated in both the directions; to convert this power into one way, a special component is used called zener diode for continuous supply. All this mechanism can be housed under the dome, like speed breaker, which is called HUMP. 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.

A. Possible using different Mechanisms:-
   1. Spring coil mechanism
   2. Rack- Pinion mechanism
   3. Crank-shaft mechanism
   4. Roller mechanism

B. Rack and Pinion Mechanism

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

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 shaft using chain and sprocket drive.

![Image](https://example.com/image1.png)

**Fig. 1:** Rack and pinion mechanism

The head of rack is brought up to level beneath the speed breaker surface. When vehicle moves on the speed breaker, the rack it will be pushed down. The rack is attached with free wheel type pinion that rotates in one direction only. The rack & pinion arrangement convert reciprocating motion in to rotary motion.

This rotary motion is further magnified using reciprocating motion in to rotary motion-belt & pulley drive. The output of pulley is attached with flywheel which stores kinetic energy and transfer to dynamo which generate electricity with zero cost. A “generator” and “motor” is essentially the same thing: what you call 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 spin. This generated power is used for various application required by different user.

**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.

Whenever an armature rotates between the magnetic fields of south and north poles, an E.M.F (electromotive 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.

![Image](https://example.com/image2.png)

**Fig. 2:** Block diagram

**EQUIPMENTS 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 or 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. **FLY WHEEL:** The primary function of flywheel is to act as an energy accumulator. It reduces the fluctuations in speed. It absorbs the energy when demand is less and releases the same when it is required.

E. **SHAFTS:** 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. **SPRINGS:** It is defined as an elastic body whose function is to distort when loaded and to recover its original shape when the load is removed. It cushions, absorbs or controls energy either due to shocks or due to vibrations.

G. **ELECTRIC DYNAMO:** It is a device, which converts mechanical energy into electrical energy. The dynamo 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.”
A dynamo machine consists of a stationary structure, called a stator, which provides a constant magnetic field, and a set of rotating winding called the armature which turns within that field.

CIRCUIT DIAGRAM

A. Bridge Rectifier

According to the conventional model of current flow (originally established by Benjamin Franklin and still followed by most engineers today [6]), current is assumed to flow through electrical conductors from the positive to the negative pole. In actuality, free electrons in a conductor nearly always flow from the negative to the positive pole. In the vast majority of applications, however, the actual direction of current flow is irrelevant. Therefore, in the discussion below the conventional model is retained.

B. IC1-CD4047

IC1-CD4047 consist of a gatable, astable multivibrator with logic techniques incorporated to permit positive or negative edge-triggered monostable multivibrator action with retriggering and external counting option.

C. AC TO 9V AC Transformer

As per our requirement in this circuit diagram we have use 230v ac to 9v ac. Transformer is a static device which converts electrical energy from higher voltage to lower voltage or vice versa.

BSERVATIONS

As far as the experiment concerns, we have two related observations with regard to the voltage generated to the variations in speed and load. The following were the two illustrations:

(a). Let us consider the load (heavier vehicle) is constant on the speed breaker. Now we have the voltage produced, to the variations in the speed of the vehicle. If the vehicle runs slowly then it certainly applies the pressure on the speed breaker for a long time so the voltage produced will be most in this case. While we keep on increasing the speed, the vehicle rushes over the speed breaker, the pressure keep on decreasing so as the voltage produced. The graph plotted between these two variables, is shown Fig. 3.

(b). Let us consider the speed (usually low) of the vehicle is kept constant on the speed breaker. Now we have the voltage produced, to the variations in the load (vehicles) applied on the speed breakers. Assume, if the vehicle that runs over it has the least load capacity compared to others then it certainly applies a very less pressure that result in a least voltage produced. Now as the load keep on increasing, the voltage produced also kept increasing because the pressure on breaker keeps increases with the load.

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.

f. Energy available all year round.

CONCLUSION

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 is 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 forward these types of innovative ideas, and researches should be done to upgrade their implication.
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