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# Electrical Power Generation for Street Light Using Speed Breaker

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**ABSTRACT:** In this project, we propose a renewable non-conventional energy source based on speed breaker mechanism. This is to enlighten the streets utilizing the jerking pressure which is wasted during the vehicles passes over speed breaker in roadside. We can tap the energy generated by moving vehicles 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 through rack and pinion mechanism and this mechanical energy will be converted to electrical energy using generator which will be used for lighting the street lights. Therefore, by using this mechanism we can save lot of energy which can fulfill our future demands.

## I. INTRODUCTION

Energy is the capacity of a physical system to do work. The common symbol for energy is the uppercase letter E. The standard unit is the joule, symbolized by J. One joule (1J) is the energy resulting from the equivalent of one newton (1N) of force acting over one meter (1 m) of displacement. There are two main forms of energy, called potential energy and kinetic energy. Potential energy, sometime symbolized U, is energy stored in a system. A stationary object in a gravitational field, or a stationary charged particle in an electric field, has potential energy.

Kinetic energy is observable as motion of an object, particle, or set of particles. Examples include the falling of an object in a gravitational field, the motion of a charged particle in an electric field, and the rapid motion of atom's or molecule's when an object is at a temperature above zero kelvins. Energy is the primary and most universal measure of all kinds of works by human beings and nature. Everything what happens in the world is the expression of flow of energy in one of its forms. Most people use the word energy for input to their bodies or to the machines and thus think about crude fuels and electric power. Energy in the form of electricity plays a very important role in the life of a normal man. Electricity is one of the greatest wonders of science. Next to man, it is the most important and revolutionary creation in this world of ours. It has practically revolutionized the world.

### 1.1. Existing System

In the existing system the power generation is less. Maintenance cost is high. Wear and tear is high. It May not work properly in rainy season. We have to check mechanism from time to time. In this mechanism there is no continuity in power production and very low efficiency.

## II. PROPOSED SYSTEM

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's economy. We could make it more efficient, by also having solar panels that provides for power needs while the vehicles were not moving.

This paper attempts to show how energy can be tapped and used at a commonly used system- the road speed breakers. The number of vehicles passing over the speed breaker in roads is increasing day by day. A large amount of

energy is wasted at the speed breakers through the dissipation of heat and also through friction, every time a vehicle passes over it. There is great possibility of tapping this energy and generating power by making the speed-breaker as a power generation unit. The generated power can be used for the lamps, near the speed breakers. Next time 12 on the roads, don't scoff at the speed breakers. They could actually light up small villages off the highway. The rotor (rotating shaft) is directly connected to the prime mover and rotates as the prime mover turns. The rotor contains a magnet that, when turned, produces a moving or rotating magnetic field. The rotor is surrounded by a stationary casing called the stator, which contains the wound copper coils or windings.

When the moving magnetic field passes by these windings, electricity is produced in them. By controlling the speed at which the rotor is turned, a steady flow of electricity is produced in the windings. These windings are connected to the electricity network via transmission lines. A vehicle weighing 1,000 kg going up a height of 10 cm on such a rumble strip produces approximately 0.98 kilowatt power. So one such speed breaker on a busy highway, where about 100 vehicles pass every minute, about one kilo watt of electricity can be produced every single minute. The figure will be huge at the end of the day. A storage module like an inverter will have to be fitted to each such rumble strip to store this electricity. The cost of electricity generation and storage per megawatt from speed-breakers will be nearly Rs 1 crore as opposed to about Rs 8 crore in thermal or hydro power stations.

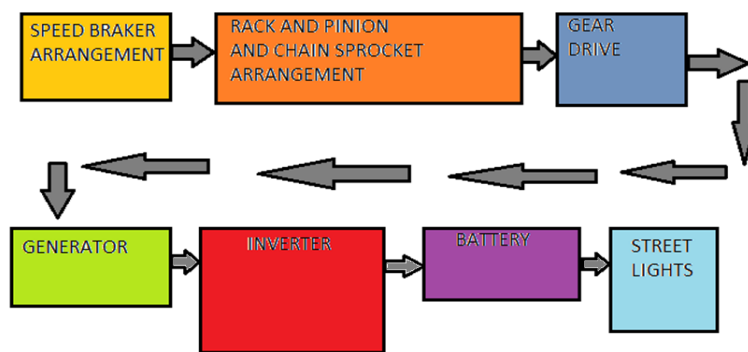


Figure 1. Block diagram of power generation

The functioning will be as follows:

1. The speed breaker on a busy road will be lifted to some height from one side and fixed to the road from other side.
2. Then there will be a shock absorber kind of mechanism beneath the speed breaker. The arrangement will be as in a cam and shaft arrangement.
3. The shaft of the generator placed below will be attached to the cam and the rod connected to the speed breaker vertically will be on cam. This arrangement will make one rotation of generator shaft as soon as a vehicle moves over speed breaker.
4. The rotations can also be increased using certain mechanism, like gears and all Possible using different Mechanism
  - Spring coil mechanism
  - Rack- Pinion mechanism
  - Crank-shaft mechanism
  - Roller mechanism

**2.1. Working Principle:**

The load acted upon the speed breaker - setup is there by transmitted to rack and pinion arrangements. Here the reciprocating motion of the speed- breaker is converted into rotary motion using the rack and pinion arrangement. The axis of the pinion is coupled with the sprocket arrangement. The sprocket arrangement is made of two sprockets. One of larger size and the other of smaller size Both the sprockets are connected by means of a chain which serves in transmitting 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 diameters.

The gear wheel with the larger dimension is coupled to the axis of the smaller sprocket. Hence the speed that has been multiplied at the smaller sprocket wheel is passed on to this gear wheel of larger dimension. The smaller gear is coupled to the larger gear. So as the larger gear rotates at the multiplied speed of the smaller sprocket, the smaller gear following the larger gear still multiplies the speed to more intensity. Hence, although the speed due to the rotary motion achieved at the larger sprocket wheel is less, as the power is transmitted to gears, finally the speed is multiplied to a higher speed.

**2.2 Fabrication:**

This setup mainly consists of an arrangement which is having a shaft with a U shaped projection carrying a bearing and is connected to the top of the speed breaker. The bearing is provided in order to permit the relative motion between the shafts. In this way vertical motion is to be converted into rotational motion. The top of the speed breaker will be provided with the return spring in order to retain its position after it will be displaced by the weight of the vehicles in the downward direction.

The spring is designed depending on the weight of the vehicles passing through it. The two ends of the shaft will be fixed with the help bearing. The shaft is made of mild steel. This shaft will also be provided with the sprocket, as it will rotate in direction of the shaft. This sprocket will be connected with another sprocket with the help of chain drive, which is mounted on the other shaft this action is like the bicycle arrangement. The lower shaft also consists of a gear. A gear is also mounted on the generator and is meshing with gear on the lower shaft this will help to rotate the D.C. generator and in turn will generate electrical power, which will be stored in the battery and can be used accordingly.

**2.3 ASIC PRINCIPLE**

The transformer is based on two principles: first, that an electric current can produce a magnetic field (electromagnetism) and second that a changing magnetic field within a coil of wire induces a voltage across the ends of the coil (electromagnetic induction). Changing the current in the primary coil changes the magnetic flux that is developed. The changing magnetic flux induces a voltage in the secondary coil. An ideal transformer is shown in the adjacent figure. Current passing through the primary coil creates a magnetic field. The primary and secondary coils are wrapped around a core of very high magnetic permeability, such as iron, so that most of the magnetic flux passes through both the primary and secondary coils. If a load is connected to the secondary winding, the load current and voltage will be in the directions indicated, given the primary current and voltage in the directions indicated.

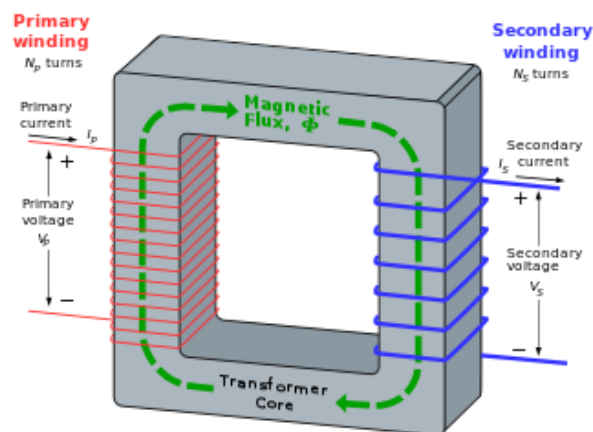


Figure 2: Transformer

**2.4 Advantage:**

- Pollution free power generation
- Simple construction and easy maintenance
- No manual work necessary during generation
- No consumption of any fossil fuel which is non-renewable source of energy

- Low budget electricity production
- Suitable at parking of multiplexes malls toll booths signal's etc.
- Efficiency up to 95%

### III. HARDWARE REQUIREMENTS

#### 3.1 CONNECTION THROUGH CHAIN DRIVE MECHANISM

When the vehicle will come on the speed breaker because of its weight the top portion of the speed breaker moves down wards and the shaft consisting of the U portion rotated in a particular direction. Due to this rotation of the shaft, the sprocket will rotate and the rotational energy from one shaft is transferred to the other shaft with the help of chain drive mechanism.

#### 3.2 THROUGH RACK AND PINION SYSTEM

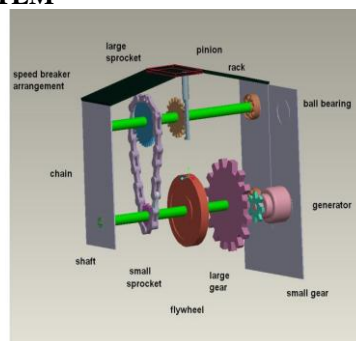


Figure 3: Rack and pinion mechanism

The sprocket arrangement is made of two sprockets one of larger size and the other of smaller size. Both the sprockets are connected by means of a chain which serves in transmitting 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.

#### 3.3 USE OF TRANSLATOR AND STATOR TOPOLOGY

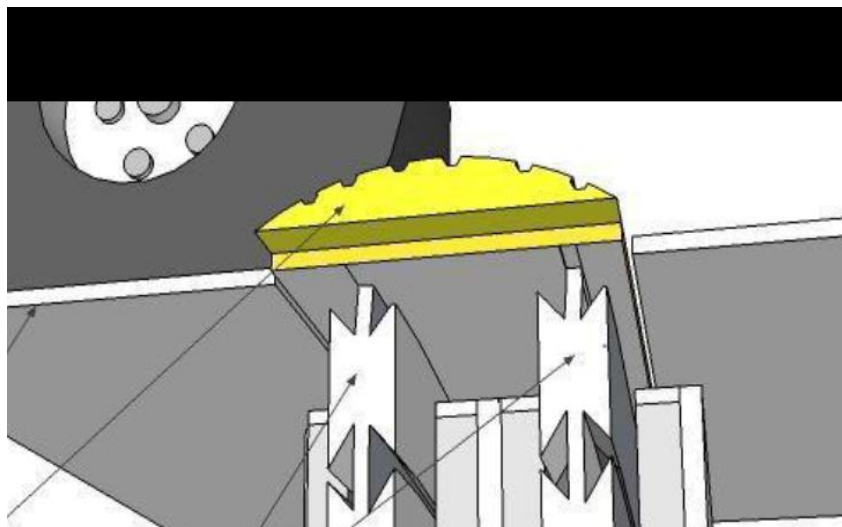


Figure 4: Translator and stator topology

#### IV. RESULTS



#### V. CONCLUSION

The fabrication and testing of electricity generation from speed breaker has completed. It is observed from testing that when vehicle run on speed breaker at constant weight the voltage is varying from 7.93 volt to 3 volt at different speed. When vehicle run slowly, the voltage produced is more and when vehicle run fast, it produces less voltage.

#### VI. FUTURE ENHANCEMENTS

- Suitable at parking of multiplexes, malls, toll booths, signals, etc.
- Used to charging batteries and to light up the streets, etc.
- Such speed breakers can be designed for heavy vehicles, thus increasing input torque and ultimately output of electrical generation.
- More suitable and compact mechanisms to enhance efficiency.

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