

# ELECTRICITY GENERATION USING SPEED BREAKER

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**Abstract:** Energy is the primary need for survival on earth. Everything that happens in the surrounding is the expression of flow of energy from one form to another. But as the world is moving forward and population is increasing day by day the conventional source of energy is reducing. Therefore, to overcome this problem we need to implement the techniques for full utilization of conventional source energy. This project includes how to use the energy which is squandered 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 component. The kinetic energy of the moving vehicles can be converted into mechanical energy of the shaft through rack and pinion mechanism which is an electromechanical principle. Then, this mechanical energy will be converted to electrical energy using PMDC motor which will be saved with the use of a battery. The energy we save during the day light can be used in the night for lighting street lamp. Therefore, by using this arrangement sufficient power can be generated to meet various daily need.

**Key Words:** Rack and pinion mechanism, Electromechanical process, PMDC motor.

## 1. INTRODUCTION

In the present scenario due to urbanization and modernization power becomes the major need for human life. The availability and its per capita use are regarded as the index of national standard of living in the present day civilization. Energy is an important input in all the sectors of any countries progress . Energy crisis is due to two reasons, firstly day to day increasing population of world and secondly standard of comfort of human beings has increased. India is the country, which majorly bear with absence of sufficient power generation. The availability of regular conventional fossil fuels will be the main sources for power generation, but there is a fear that they will get finished eventually by the next few decades. Therefore, we have to probe other types of inexhaustible sources, which produce electricity without using any fossil fuels, which does not produce any harmful products.

## 2. LITERATURE SURVEY

The thought of generating electricity basically started from South Africa, where, a businessman felt the need for a generation of electricity without compromising on any resources. For this purpose, he thought of an concept and also brought into existence, the working model of this concept. His idea was to generate electricity using speed bump. These speed bumps use the concepts of physics to convert the kinetic energy possessed by the vehicles running on the road into electrical energy, eventually generating electricity. This is where the plot for energy generating speed breakers was laid, later on, IIT Guwahati took over this project to overcome its limitations. The practical implementation of the electricity generating speed breaker has been very less and the result of the few places where it is implemented is still not known. Although, there have been many surveys to support the implementation of this idea.

### 2.1 PROBLEM STATEMENT

The demand of electricity is increasing rapidly day by day but the production rate is not according to meet the need. Establishing new power plants to generate more electrical energy is not an answer to this problem as per economical point of view. The government and the electricity generating companies is suffering huge losses in electrical power production due to inefficient methodology and various other constraints especially in thermal power plants. The huge gap between demand and production can be brimmed by producing electricity at individual level in order to meet various household needs. To generate electricity to fulfill daily or basic needs various sources can be used that are normally neglected in daily life, one of these sources include mechanical pressure of vehicles on speed breaker.

## 2.2 OBJECTIVE

The generation of electricity using speed breaker is one of the uncomplicated way as now-a -days everyone is having vehicle. It can be widely accepted at individual level because of its low production cost also it doesn't need any extra effort. Also the piezoelectric crystal which will convert the mechanical pressure in electric output will enhance the system output. The energy generated using speed breaker mechanism can be used to store in a batteries and can be used apart for various purposes. The work basically aims to produce free electricity without using fuel and with minimum requirement of space.

## 3. PROPOSED SYSTEM

4.

This project explains the mechanism of electricity generation from speed breaker. This concepts works on the basic principle of converting mechanical energy into electrical energy. The vehicle is applied on the breaker system is transmitted to rack and pinion arrangement. The reciprocating motion is converted into rotary motion using the rack and pinion arrangement. The load should be applied on the speed breaker rack moved downward and rotating the pinion. The pinion is connecting for the generator so when pinion is rotated generator power should be produced. And then converting the DC to AC generator and to save the electricity from batteries. Finally we can use the batteries for lighting the lights.

### 3.1 ARRANGEMENTS

The assembly is so arranged that there are two steel plates, and one one of the steel plate the PMDC motor is fixed in the centre of the base plate and a hollow cylinder is fixed on either side of the PMDC motor on which the spring is assembled. The shaft of the motor is attached to the gear and gear is connected to the the rack and pinion mechanism in which rack is connected to the upper plate. L-section is placed around the hollow cylinder on both the plates so that the spring does not move from its position. And four C-section are provided around the corner of the base plate. The upper plate is also provided with two hollow cylinders and four rectangular sections are provided on the corner of the upper plate on which bearing is fixed.

### 3.2 WORKING

When the load is applied to the speed breaker the speed breaker compresses due to which the vertical shaft that is fixed on the upper plate moves downward and creates motion in the gear, as the gear is connected to shaft of the motor the shaft also rotates and hence electricity is produced.

As the vehicle crosses the speed breaker, the speed breaker comes to its original position due to spring action. While coming to its original position it again creates motion in the gear and hence again electricity is produced. When the vehicle is in motion it carries some kinetic energy which is wasted. This kinetic energy can be used to produce power by using a special arrangement. This special arrangement is called as POWER HUMP. It utilizes both mechanical and electrical techniques for the power generation and its storage. POWER HUMP is a arch like device likely to be a speed breaker. Whenever the vehicle is allowed to pass over the speed breaker it gets pressed downwards, the springs attached to the assembly is compressed and the vertical shaft which is attached to the bottom of the upper plate moves downward in reciprocating motion.

### 3.3 POWER CALCULATION GENERATED

Let us consider,

The mass of any vehicle travelling over the speed breaker= 400Kg (Approximately)

Height of speed brake = 20 cm

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

Here, Weight of the Body = 400 Kg x 9.81 = 3924 N

Distance traveled by the body = Height of the speed breaker = 20 cm

Power = Work done/Second = (3924 x 0.20)/60 = 13.08 Watts

Output Power developed for 1 vehicle passing over the speed

Breaker arrangement for one minute = 13.08 watts

Power developed for 60 minutes (1 hr) = 785 watts

Power developed for 24 hours = 18.8 Kw

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

## 4 DESCRIPTION OF COMPONENTS

### 4.1 RACK AND PINION MECHANISM

A rack and pinion is a type of linear actuator which contains a pair of gears of which one is vertical and other is circular both combine converts rotating motion into linear motion. The circular pinion engages teeth on the "gear" bar – the rack. When the load is applied the rack moves downwards and creates motion in the the circular pinion.. Rack and pinion mechanism converts the pressure applied by vehicle into rotary motion.



**Fig -1** Rack and pinion

### 4.2 SHAFT

A shaft is a rotating motor element, usually circular in cross section, which is used to carry power from one part to another, or from a motor which produces power to a motor which absorbs power. Shafts are commonly made of mild steel. When more high strength is required, alloy steel such as nickel, nickel-chromium or chromium-vanadium steel is used. The rotation of shaft due to rack and pinion mechanism act as a input to dc generator which produces the desired electrical output.



**Fig – 2** shaft

### 4.3 DC GENERATOR

DC generator is machine which converts mechanical energy into electrical energy . This energy conversion is based on the principle of electromotive force. The dc generator of 1500 rpm is used in our system which convert the mechanical input provided

by mechanical arrangements into electrical output. The input to dc generator is fed by the rotation of shaft obtained from rack and pinion system.



**Fig – 3** PMDC motor (as a generator)

#### **4.4 BATTERY**

Battery is used to store energy produced by the DC generator. A battery is composed of one or more electrochemical cells. The term "accumulator" is also termed for battery as it accumulates and stores energy through a reversible electrochemical reaction. Batteries are produced in many different shapes and sizes, and ranging from different capacity.



**Fig – 4** BATTERY

#### 4 INSTALLATION AND UTILIZATION OF THE PROJECT

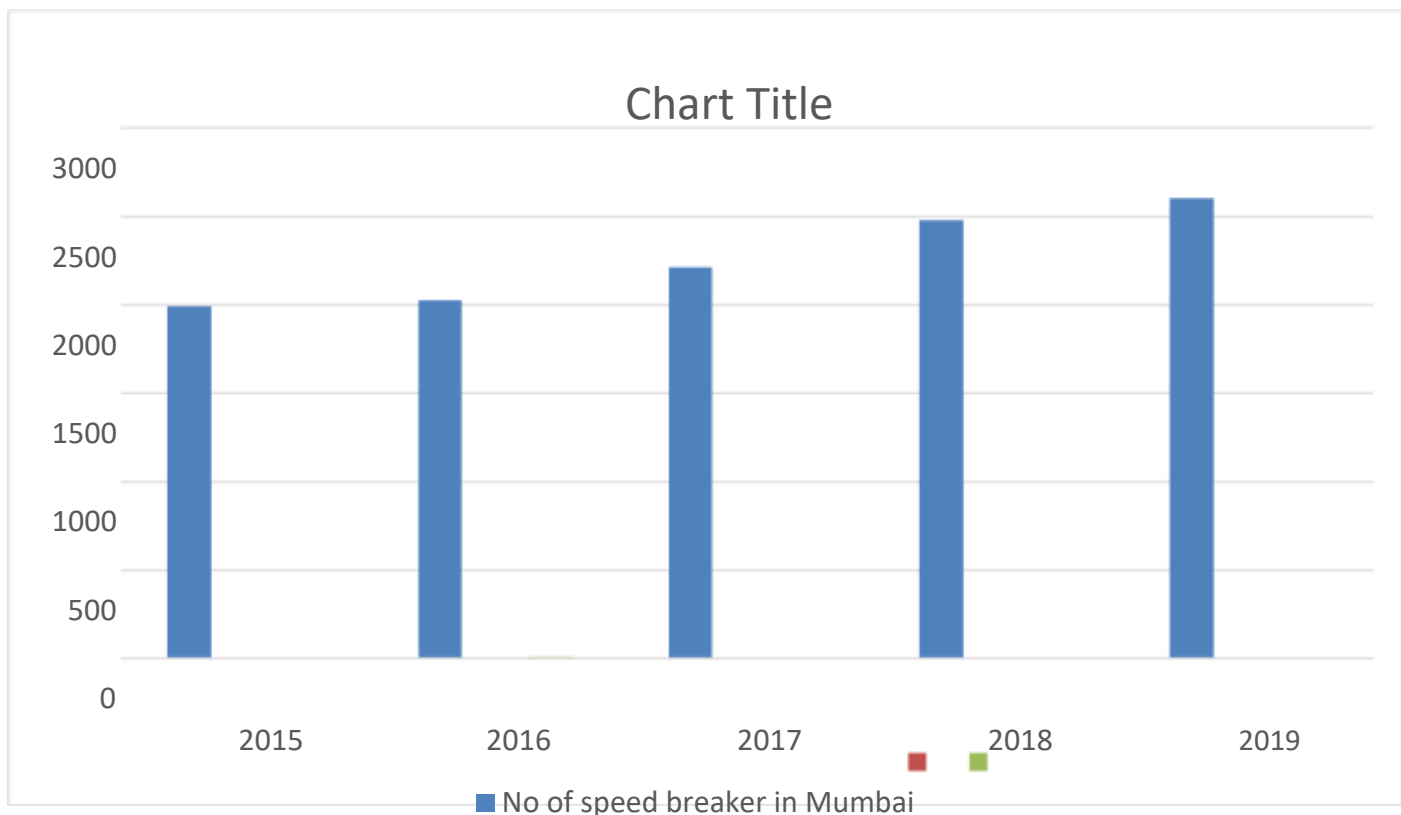
This arrangement shall be installed at the toll gate of highway, where the speed of vehicles is limited/slow, which is ideal to operate the arrangement in proper manner. Energy from the moving vehicles on the road can be utilized for the needful purpose of energy transformation to generate electricity. The energy which is being lost without any utilization now can be stored. The generated electricity shall be useful to illuminate street lights in the locality of toll gate, to charge UPS Batteries, to charge batteries of electric cars at battery charging depot at toll gate.

#### 5 ADVANTAGES

Such speed breakers can be easily mounted and can also be designed for heavy vehicles, thus increasing input torque and hence output of generator. These prototypes can be readily manufactured and put to use at all public toll-plazas to bring about an efficient system wherein the electricity generated can be used to lighten up the areas of the same place where it is generated thus making a self-sufficient model. These can be mainly used at toll booths, approaching traffic signals, parking plots of malls and complexes etc. It is economical and not difficult to install. Energy is produced without any pollution. This method is promising due its good efficiency and energy recovery criteria.

#### 6 APPLICATIONS

The power generated can be used for lighting of street light, and for lighting of traffic signals, boards near the bus stop, sign board on roads, check posts on highways.



*Above data is taken from reliable well known news paper citing no. of speed breaker in city of Mumbai*

## 7 CONCLUSION

This method adapts an inexhaustible source to generate electricity. To most economical and reliable method to generate electricity. The progress of a country is directly proportional to the way in which it uses power supply adequately and efficiently. This idea not only provides an alternative, but also adds to the economy of the country. Development of every country is the development of the world. The energy is an important input to assist industrial growth and standard of living of a country can be precisely related to energy consumption. The typical energy sources like coal, oil, uranium etc. are exhausting very rapidly and by the turn of the century man will have to depend upon non-conventional sources of energy for power generation. In this world where there is a shortage of electric power supply, the project will be helpful to solve some of the problems. As the graph above shows that the number of speed breakers is increasing every year this project has tremendous scope in a fast moving world. Benefits of the electricity generation by using speed breaker such as it is Pollution free power generation; Simple construction, mature technology, and easy maintenance.

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