

# POWER GENERATION USING SPEED BREAKER

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**ABSTRACT** - In the present day scenario the fossil fuel sources are fast depleting and their combustion products are causing global environmental problems. So it is inevitable to shift towards the use of renewable energy resources which in turn will reduce pollution and saves fossil fuels. There is a need to develop non-conventional sources for power generation due to the reason that our conventional sources of power are getting scarcer and polluting our atmosphere day by day. This project emphasizes on the idea that the kinetic energy getting wasted while vehicles move can be utilized to generate power by using a special arrangement of Rack and Pinion with Ratchet Mechanism. This generated power can be used for general purpose applications like streetlights, traffic signals. 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.

**Keywords-** Electricity, Speed breaker, Power source, Conventional, Non-conventional, alternating current, generation, dynamo, transmission, rack and pinion, flywheel, tension springs, shaft, ratchet.

## 1, INTRODUCTION

In the present day scenario power has become the major need for human life. Energy is an important input in all the sectors of any countries economy. The day-to-day increasing population and decreasing conventional sources for power generation, provides a need to think on non-conventional energy resources. In this project, we focus on the fixed speed-breaker at the streets since a high amount of vehicles kinetic energy is wasting there. There are thousands of crowded cities with enormous flow of vehicles offers high amount of energy can be considered as near to urban resource of energy. Also, extraction of such energy allows eliminating of transmission system between the remote areas and urban area for lightings purposes. Here in this paper we are looking forward to conserve the kinetic energy that has wasted, while vehicles move. In this modern era electricity has become one of the basic amenities for survival. Man is totally dependent on electronics nowadays. Consumption of electricity in India is growing day by day and there are very less resources to meet the demands of the people because consumption is very much greater than the supply.

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## 2, 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.

## 3, MECHANISM INVOLVED

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 Sped breaker installing different units. All the units are connected to the common shaft.

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 the pinion. The rack & pinion arrangement convert reciprocating motion in to rotary motion.

The output of pinion is attached with ratchet with the help of a shaft. The ratchet converts the bi-directional rotation into a uni-directional rotational motion. The ratchet is attached to the flywheel by welding. The flywheel stores the kinetic energy and transfer to dynamo which generate electricity with zero cost.

As the vehicle moves over the roller the gear arrangement attached to the roller comes into motion. The rotation of larger gear attached to the roller causes the smaller gear to rotate. One rotation of the larger gear is equal to five rotations of the smaller gear.

The smaller gear of the gear arrangement is attached to the dynamo. The dynamo here is used to convert the rotational energy into electrical energy.

A rectifier circuitry is being used to convert ac into dc. The electrical energy is then stored into the battery which is connected to the inverter circuitry. Finally through this arrangement we can obtain a maximum of 15 W power supply.

#### **4, PROCESS INVOLVED**

Our project requires fabricating various components independently and then assembling them together. Various machining activities were performed to fabricate the individual components. In this section we are going to discuss about the parts fabricated and the manufacturing process employed in the fabrication.

The major operations done in design and fabrication are as follows:

- Cutting
- Grinding
- Welding

##### **4.1 Cutting**

Cutting operations are done so as to make the materials in proper dimensions. The cutting operations are done by the various cutters available in the market just like dewalt, black decor etc. hack saw are used for soft iron parts such as stainless steels.

##### **4.2 Drilling**

Drilling is a cutting process that uses a drill bit to cut or enlarge a hole in solid materials. The drill bit is a multipoint, end cutting tool. It cuts by applying pressure and rotation to the work piece, which forms chips at the cutting edge.

##### **4.3 Welding**

Welding is a process for joining different materials. Welding joins different metals or alloys with the help of a number of processes in which heat is supplied either electrically or by means of a gas torch. Heat and pressure are the important requirement in welding. The type of welding done here is arc welding.

#### **5, MATERIAL DISCRPTION**

##### **5.1 Rack and Pinion**

A rack and pinion is a type of linear actuator that comprises a pair of gears which convert linear motion into rotational motion. A circular gear called "the pinion" engages teeth on a linear "gear" bar called "the rack"; linear motion applied to the rack causes the pinion to rotate, thereby translating the linear motion of the rack into the rack motion of the pinion. For every pair of conjugate involute profile, there is a basic rack. This basic rack is the profile of the conjugate gear

of infinite pitch radius. The 'pinion' is the normal round gear and the 'rack' is straight or flat. The 'rack' has teeth cut in it and they mesh with the teeth of the pinion gear.

### 5.2 Tension springs

Extension springs are attached at both ends to other components. When these components move apart, the spring tries to bring them together again. Extension springs absorb and store energy as well as create a resistance to a pulling force. It is initial tension that determines how tightly together an extension spring is coiled. This initial tension can be manipulated to achieve the load requirements of a particular application. Extension Springs are wound to oppose extension. They are often tightly wound in the no-load position and have hooks, eyes, or other interface geometry at the ends to attach to the components they connect. They are frequently used to provide return force to components that extend in the actuated position.

Extension spring ends include threaded inserts, extended twist loops, crossover center loops, hooks, expanded eyes, and reduced eyes, rectangular ends and teardrop-shaped ends, which can all be produced to vary in distance from the spring body. At the design stage of Custom Extension Springs, the length of the hooks at each end of the spring can be adjusted in order to precisely obtain the required spring load at any extended position.

### 5.3 Flywheel

A flywheel is a rotating mechanical device that is used to store rotational energy. Flywheels have a significant moment of inertia and thus resist changes in rotational speed. The amount of energy stored in a flywheel is proportional to the square of its rotational speed. Energy is transferred to a flywheel by applying torque to it, thereby increasing its rotational speed, and hence its stored energy.

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### 5.4. Shaft

Shaft is a mechanical component for transmitting torque and rotation, usually used to connect other components of a drive train that cannot be connected directly because of distance or the need to allow for relative movement between them. As torque carriers, drive shafts are subject to torsion and shear stress, equivalent to the difference between the input torque and the load. They must therefore be strong enough to bear the stress, whilst avoiding too much additional weight as that would in turn increase their inertia.

### 5.5. Ratchet

A ratchet is a mechanical device that allows continuous linear or rotary motion in only one direction while preventing motion in the opposite direction. Ratchets are widely used in machinery and tools. Though something of a misnomer, "ratchet" is also often used to refer to ratcheting socket wrenches, a common tool with a ratcheting handle. A ratchet consists of a round gear or linear rack with teeth, and a pivoting, spring loaded finger called a pawl that engages the teeth. The teeth are uniform but asymmetrical, with each tooth having a moderate slope on one edge and a much steeper slope on the other edge.

When the teeth are moving in the unrestricted (i.e., forward) direction, the pawl easily slides up and over the gently sloped edges of the teeth, with a spring forcing it into the depression between the teeth as it passes the tip of each tooth. When the teeth move in the opposite (backward) direction, however, the pawl will catch against the steeply sloped edge of the first tooth it encounters, thereby locking it against the tooth and preventing any further motion in that direction.

## 5.6 Dynamo

A dynamo is an electrical generator that produces direct current with the use of a commutator. Dynamos were the first electrical generators capable of delivering power for industry, and the foundation upon which many other later electric-power conversion devices were based, including the electric motor, the alternating-current alternator, and the rotary converter. Today, the simpler alternator dominates large scale power generation, for efficiency, reliability and cost reasons. A dynamo has the disadvantages of a mechanical commutator.

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 induction. A dynamo machine consists of a stationary structure, called the stator, which provides a constant magnetic field, and a set of rotating windings called the armature which turn within that field. The motion of the wire within the magnetic field causes the field to push on the electrons in the metal, creating an electric current in the wire. On small machines the constant magnetic field may be provided by one or more permanent magnets; larger machines have the constant magnetic field provided by one or more electromagnets, which are usually called field coils

## 6. ASSEMBLING PROCESS

### 6.1 Base frame

The base frame for the prototype is made out of hollow carbon steel of 1.5mm thickness. The hollow beams are welded together using arc welding.

### 6.2 Rack and Pinion

The rack and pinion used in this prototype is from a Maruti 800 steering system, which was obtained from a local market. A 30mm hollow pipe is welded along the rack and pinion housing in the direction of axis of the rack movement. This setup is then welded together with the base frame.

### 6.3 Ratchet

The shaft from the pinion which was provided along with the steering system was welded together with a ratchet at the other end. The shaft is welded on the inner rim of the ratchet. The ratchet allows only one direction of rotation.

### 6.4 Flywheel

The flywheel used is of 205mm diameter and 3 mm thickness. The flywheel is welded to the outer rim of the ratchet. The other side of the flywheel is attached to the dynamo.

### 6.5 Spring

The spring is attached to the frame using a bolt welded to the frame. The other end of the spring is attached to the end of the rack.

### 6.6 Sheet metal

The sheet metal is bent in the shape of a speed breaker bump and then welded with the rack with a hollow metal frame in between.

### 6.7 Dynamo

The dynamo shaft is attached to the flywheel. The dynamo is supported by mounting it on the base frame. Once all the parts are welded together the assembled kit is coated with a layer of red oxide to prevent it from rusting.

## 7, CONCLUSION

The energy is an important input to sustain industrial growth and standard of living of a country can be directly related to energy consumption. The conventional energy sources energy like coal, oil, uranium etc. are depleting very fast 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. Advantages of the electricity generation by using speed breaker such as it is Pollution free power generation; Simple construction, mature technology, and easy maintenance; No manual work necessary during generation; Energy available all year round; No fuel transportation problem; No consumption of any fossil fuel which is nonrenewable source of energy; No external source is needed for power generation; Less floor area.

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