

# Energy Generation Using Rack and Pinion Method

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## ABSTRACT:

In the current situation power becomes basic need for human life. Energy plays very important role in development of any country. Conventional energy sources generate most of the energy of today's world. Now a day's population is increasing and conventional energy sources are reducing. Moreover, these conventional sources are polluting and responsible for Global Warming, so renewable sources are needed to be developed for power generation, which are clean, environment friendly and sustainable. In this research we illustrate the generation of energy through speed breakers. Here we are used a technique of harvesting energy by Rack and Pinion mechanism. This technique is beneficial to those areas where generation of electricity is a difficult task. When a vehicle moves over the speed breaker it's kinetic energy which is due to it's speed, friction between road and its wheels. The world is growing at a rapid pace. Among many vital sectors of our social life, transportation sector has a key role to play. It is an ever growing sector with the escalating population, growing needs and creeping numbers of vehicle users. Now a days the traffic on the road becomes doubled or tripled, at alarming rates. If vehicular motion can be put to generate useful power, it can be put to effective use. This idea has mothered the invention of "Energy Generation through Speed Breakers. To generate power using speed breakers through rack and pinion mechanism by tapping the energy and utilizing it for various purposes such as lighting the street light. This electrical energy in the form of DC and we used inverter which convert DC into AC. Large amount of electricity can be generated saving lot of money and if implemented will be very beneficial and fulfil our future demand.

**KEYWORDS-** Kinetic Energy, Rack and Pinion, Speed Breaker, Generator, Renewable Energy, Street Light

**INTRODUCTION-**Man in his lifetime uses energy in one form or the other. In fact whatever happens in nature, results, out of the conversion of energy in one form or the other. The blowing of the wind, the formation of the clouds and the flow of water are the few examples that stand testimony to this fact. The extensive usage of energy has resulted in an energy crisis, and there is a need to develop methods of optimal utilization, which will not only ease the crisis but also preserve the environment. Here we show how man has been utilizing energy and to explore prospect of optimizing the same. Researches show that the world has already had its enough shares of it's energy resources. Fossil fuels pollute the environment. Nuclear energy requires careful handling of both raw as well as waste material. The focus now is shifting more and more towards the renewable sources of energy, which are essentially non-polluting. A large amount of kinetic 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.

**OBJECTIVES**-In this project we are converting mechanical energy into electrical energy. We are trying to utilize the wasted energy in a useful way. By using Rack and Pinion arrangement we are converting to and fro motion of the steps into rotational motion of the dynamo.

### **RACK-PINION PRINCIPLE**

A rack and pinion is a type of straight actuator that comprises a pair of equipments which converts rotational motion into linear shift. A circular gear called “the pinion” engross teeth on a linear “gear” bar called “the rack”; rotational motion applied to the pinion causes the rack to move relative to the pinion, thereby translating the rotational motion of the pinion into linear motion.



A rack and pinion is generally found in the steering system of cars or other wheeled, steered vehicles. The head of the 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 with free wheel type pinion that rotates in one direction only. The rack and pinion arrangement convert reciprocating motion in to rotary motion. Further this motion with the help of pulley and drives are magnified. At the output side, we fixed dc generator for power generation.

### **EQUIPMENT REQUIRED**

- 1. Rack-pinion gears:** A rack and pinion gears arrangement is consist of two gears. The normal round gear is the pinion gear and the straight or flat gear is the rack. The rack has teeth cut into it and they mesh with the teeth of the pinion gear.  
Rack and pinion gears are available in three variations:
  - a. Straight teeth**
  - b. Helical teeth**
  - c. Roller pinion**
- 2. Ball Bearing:** A ball bearing is a type of rolling-element bearing that uses balls to maintain the separation between the bearing races. The purpose of a ball bearing is to reduce rotational friction and support radial and axial loads.



3. **Fly Wheel:** When the energy sources are discontinuous, flywheel is used to providing continuous energy.

#### 4. Chain Sprocket

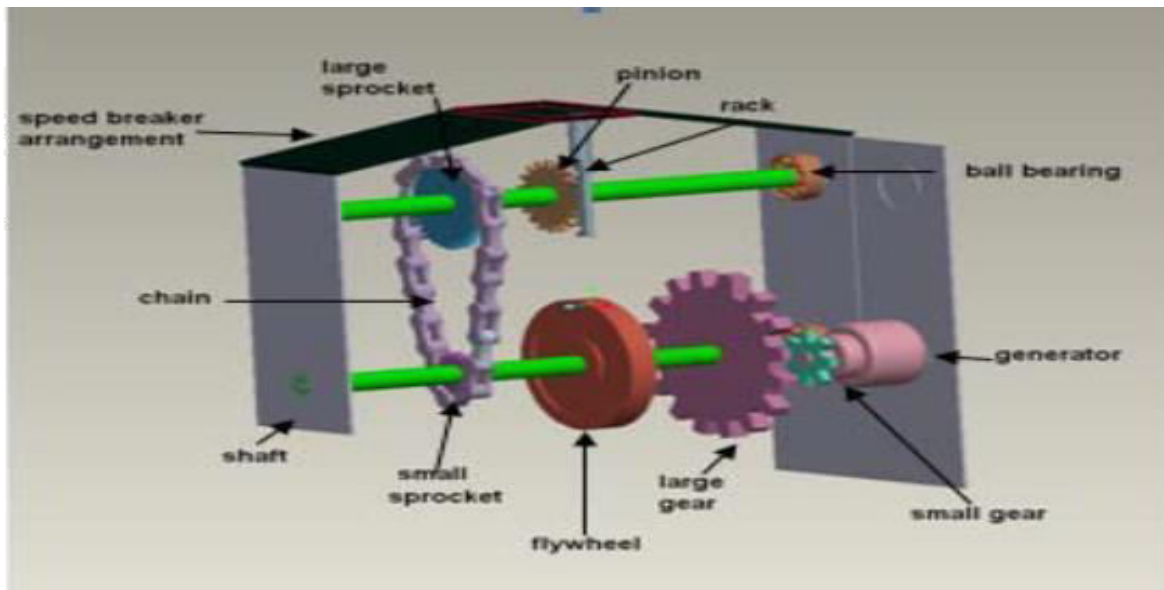
A chain and sprocket drive is a type of power transmission in which a roller chain engages with two or more toothed wheels or sprockets, used in engines as a drive to transfer motion from one shaft to another.

5. **Flywheel with Bearing** A flywheel is a mechanical device specifically designed to efficiently store rotational energy (kinetic energy). Flywheels resist changes in rotational speed by their moment of inertia. The amount of energy stored in a flywheel is proportional to the square of its rotational speed and its mass. The way to change a flywheel's stored energy without changing its mass is by increasing or decreasing its rotational speed.

#### 6. DC Generator

It is a device which converts mechanical energy into electrical energy. The generator uses rotating coil of wire and magnetic fields to convert mechanical rotation into pulsing direct electric current through Faraday's law of electromagnetic induction.

### CONSTRUCTIONAL DETAILS



## RATINGS

- Rack- 40 teeth
- Pinion- 14 teeth
- Shaft- 25mm
- Small Sprocket- 40 teeth
- Flywheel diameter- 8 inch
- Flywheel weight- 5kg
- Generator- 4-5 Volt Output
- Simplex Chain
- Battery- 12V, 7.3A (approx..)
- Convertor Circuit DC to AC
- LED
- Multimeter

## CONCLUSION

- This type of electricity generation helps us in saving our conventional resources as it generates electricity through renewable natural resources which are easily available. By this method electricity can be generated without depending on other factors and can meet high demands of future. It is also environment friendly process. There is also no where obstruction in traffic flows. It is automatic and no need of man power resource in this. This has application in many areas such as street lights and traffic lights which stop accidents from happening. "Electricity plays a very important role in our life". As the population of India is increasing day by day, the electricity generation has become a major issue and it does not fulfill the requirements of people. We described here about a technology to generate electricity from speed breakers which is reliable and will help in conserving our natural resources.

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