



# International Journal of Advanced Research in Electrical, Electronics and Instrumentation Engineering

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## Electricity Generation from Railway Track by using Power Hump

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**ABSTRACT:** In this paper we are generating electrical power as non-conventional method by simply utilizing energy from the rail track. Non-Conventional energy system is very essential at this time to our nation. A special arrangement called “POWER HUMPS” is used which consists of rack and pinion arrangement, sprocket and chain drive mechanism and electric generator. Rack and pinion gear arrangement is used to produce rotary motion from linear motion. Sprocket and chain drive mechanism to increase the rotation of the shaft in the ratio of 1:3 and this shaft transmits the rotary motion to a generator for the generation of power.

**KEYWORDS:** Power Hump, Gear Rack, Pinion, Sprocket, Chain Track arrangement, Generator.

### I. INTRODUCTION

India has a vast supply of renewable energy resources, even though energy crisis has become a great bottle necks in our sophisticated life. The total demand for electricity is expected to cross 2550,000 MW by 2030. The electrical sector has an installed capacity of 185.5GW as of November 2011. The thermal power plant constitute 65% hydroelectricity has 25% and the rest is the combination of wind and solar power. In January 2012 over 700 million citizens had no access to electricity and many people get electricity.

### II. OBJECTIVES

This arrangement can be implemented at both entry and leaving point in railway station. So that power generation rate is increased by our effective innovation approach and finds a new way to make use of railway tracks.

### III. PROJECT DESCRIPTION

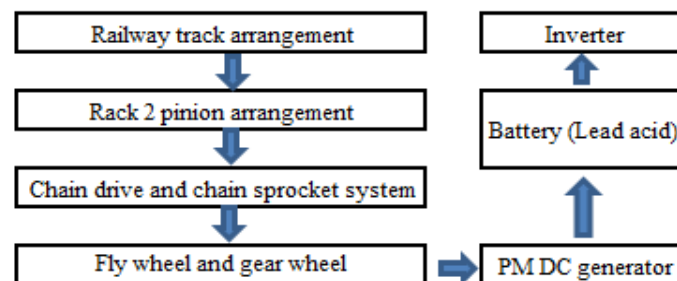


Fig. 1. Block Diagram

#### A. WORKING:

While moving, the vehicle passes some kinetic energy and it is being wasted. 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

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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 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 rpm these shafts are connected through a belt drive to the DC Generators, which converts the mechanical energy into electrical energy.

By rotating same EMF, is induced, for this rotation kinetic energy of moving vehicles is utilized. The power is generated in both the directions; all this mechanism can be housed under the dome, like speed breaker, which is called hump. The electrical output can be improved by arranging this power hump in series. This generated power can be stored by using different electrical devices such as battery. To enhance the working of entire system piezo electric crystals can be installed which will get the mechanical energy and add up to the overall energy produced. The output of the system will obviously depend upon the number of vehicles crossing the speed breaker. The entire system needs a rugged mechanical frame that can be installed beneath the roads. The main advantage of this process is that input to the system is non-terminating and is absolutely free of cost producing considerable amount of output to fulfil various daily need.

## **B. Procedure**

As the train passes over the railway track, the load acted upon the flap/which is placed over the track. The generated load to transmit from rack to pinion and chain sprocket arrangement. So the reciprocating motion of track is converted into rotary motion.

This rotary motion from the chain sprocket is then fed on to the gear drive which supply this motion to other shaft where flywheel, freewheel is placed. Thus flywheel multiplies speed of rotation. The speed of which is sufficient to rotate a rotor of generator where electromotive force is produced that generates electricity.

## **IV. HARDWARE DESCRIPTION**

A special arrangement called “POWER HUMP” is used which consists of rack and pinion arrangement, sprocket and chain drive mechanism, fly wheel and electric generator used for electric power generation.

### **A. Rack and Pinion**

The rack and pinion is used to convert between rotary and linear motion. The rack is flat, toothed part, the pinion is gear. Rack and pinion can convert rotary to linear or linear to rotary motion, the distance of gear determines the speed that rack moves as pinion turns.

In the rack and pinion railway a central rack between two racks engages with pinion on engine allowing the train to be pulled up very steep slope. The rack can be thought of as a sector gear with an infinitely large radius of curvature.

### **B. Generator**

A generator is a electrical machine which converts mechanical energy into direct current electricity. The energy conversion is based on principle of dynamically induced emf. The emf produced is passed through brushes to out terminals where the electrical power is connected to bus bar for further distribution.



**Fig. 2. DC Generator**

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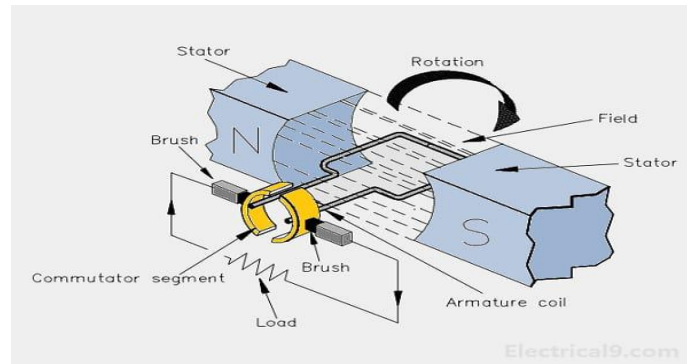


Fig. 3. Generator Operation

SL.No	PARAMETERS	RANGE/VALUE
1	Motor Size	65mm
2	Commutation	Brush
3	Speed (RPM)	120-2160
4	Output power	40-50W
5	Motor diameter	45mm
6	Shaft diameter	4mm

Table.1 DC Generator Specification

### C. Chain Drive

Chain drive is used for transmitting mechanical power from one place to another place. It is often used to convey power to the wheel of vehicle. The power is transmitted by roller chain known as the chain drive.

One problem with roller chain is “Variation in speed”, or surging, caused by acceleration and deceleration of chain as it goes around the sprocket link by link. Sometimes, the power is output simply by rotating chain.



Fig. 4. Chain Drive

### D. V Belt

It is used where great amount of power is to be transmitted from one pulley to another, when two pulleys are very near to each other.

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**Fig. 5. V Belt**

## ***E. Chain Sprocket***

A sprocket or sprocket-wheel is a profiled wheel with teeth, or cogs, that mesh with a chain, track or other perforated or indented. The machinery either to transmit rotary motion between two shafts and sprockets and chains are also used for power transmission from one shaft to another where slippage is not admissible.

Sprocket chains being used instead of belts or ropes and sprocket-wheels instead of pulleys. They can be run at high speed.



**Fig.6. Chain Sprocket**

The slipping belt of a belt is a common phenomenon in the transmission of motion or power between two shafts. The effect of slipping is to reduce the velocity ratio of the system precision machines. A gear drive is also provided, when the distance between the driver and the follower is very small.

## ***F. Flywheel***

A flywheel is a rotating mechanical device that is used to store rotational energy and also maintain the constant speed. The amount of energy stored in a flywheel is proportional to the square of its rotational speed.



**Fig. 7. Fly Wheel**

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Flywheel energy storage (FES) works by accelerating rotor to a very high speed and maintaining the energy in the system as rotational energy.

## **G. Freewheel**

In mechanical or automobile engineering freewheel or over running clutch is a device in a transmission that disengages the driveshaft from the driveshaft rotate from the driveshaft rotate faster than the driveshaft.



**Fig. 8. Free Wheel**

## **H. Return spring**

A spring is defined as an elastic body, whose function is to distort when loaded and to recover its original shape when load is removed. The spring used here are open coil helical springs which there is compression load.



**Fig. 9. Compression Spring**

A spring device must be a compromise between flexibility and stiffness. It is more rigid, it will not absorb road shocks efficiently.

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## V. WORKING PRINCIPLES

### A. Flow Chart

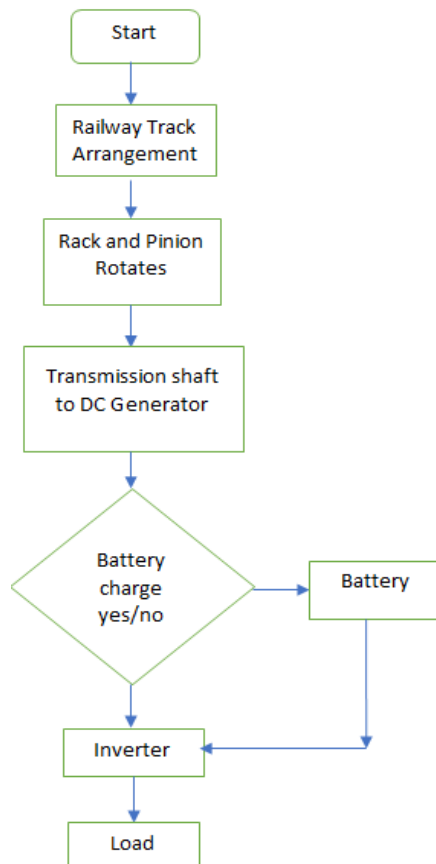


Fig. 10. Flow chart

### B. Graph

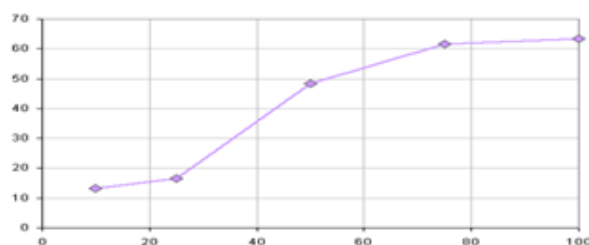


Fig. 11. Load Vs Voltage Graph

With increase in the load on the rack the output voltage increases. The dependency of the velocity of the rack and output on the load on the rack is proved.

### C. Result

Whenever train ease up on the track on this arrangement, the wheel will be rotated. The DC generator is coupled with the gear rack, so the generator shaft is rotated and generates the electrical power.



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## VI. CONCLUSION

In this paper “Railway Track Power Generation” is designed with the hope that it is very much economical and helpful to many industries and workshops. It would cost very less with all the components being available regularly. It’s pollution-free and cost-competitive with energy from new coal-and gas field power plants in many regions.

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