

Energy Generation from Speed Breaker

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Abstract – To construct an unit which is capable of producing electricity using kinetic energy of vehicles passing over the speed breakers with the help of rack and pinion arrangement beneath it. As the requirement of electricity is increasing day by day, we have to develop an alternate conventional source of energy to tackle the problem of energy crisis and reduce the dependency on power plants to some extent. Also such a unit do not require large space and cost of the unit is also comparative low. It can be employed in speed breakers where traffic intensity is very high such as Malls, Toll plazas, Multiplexes, etc. The energy obtained from it can be stored in batteries and then transmitted. This unit requires vehicle to pass over the speed breaker. As the vehicle passes over it, it presses the rack and as result it moves downward which in turn rotates the pinion. Pinion is attached to dynamo which in turn generates electricity which is stored in battery.

Index Terms – Energy Generation, rack and pinion, energy crisis, busy roads

1. INTRODUCTION

In our project our attempts is to show how energy can be tapped and used at a commonly used 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. The present work an attempt has been made to fabricate a ramp, which can utilize the kinetic energy of vehicles in power generation. This type of ramp is best suited for the places where the speed breaker is a necessity. The places like Toll bridges or on vehicle parking stands are best for its utilization. The work also discusses the shortcomings of existing methods and the ways it is countered by this method. Increasing demand of energy adds to the need of identifying non-conventional resources of energy. In my paper, I will discuss about power generation from speed breaker and the possible mechanism required for it.

2. THEORY AND CONCEPTS

2.1. EASE OF USE

The unit used for power generation from speed breaker is small as compared to other power generation units like wind mill, power plants, and other such units. Thus, it provides ease in employing the unit wherever it is required and also it is economical. Once it has been employed it only then after requires periodic maintenance which further adds ease of use of it.

2.2. WORKING PRINCIPLE

The working of power generation unit is based on actuation of rack and pinion arrangement by vehicle passing over the speed breaker. When the vehicle passes over the speed breaker rack moves downward which transmits the motion to pinion. By using pulley assembly motion is transmitted from main shaft to another shaft on which flywheel is mounted. The purpose of flywheel is to maintain constant speed and reduce the shock. The flywheel is then connected to dynamo where the actual electrical power is generated. Thus, basic principle is to convert Mechanical power to Electrical Energy.

2.3. COMPONENTS REQUIRED

2.3.1 RACK AND PINION GEARS: The selection of rack and pinion used in the power generation unit is based on load applied on the unit and the material of the rack and pinion.

2.3.2 BEARINGS:



Fig.1. Bearing

Bearing is used to mount the shaft used in power generation unit. The purpose of it is to reduce the friction between shaft and the casing. Thus, they reduce the friction and transmit the motion effectively.

2.3.3 FLY WHEEL: The primary function of flywheel is to act as an energy accumulator. It reduces the fluctuations in speed. It absorbs the energy when demand is less and releases the same when it is required.



Fig.2. Flywheel

2.3.4 SHAFTS: It is a rotating element, which is used to transmit power from one place to another place. It supports the rotating elements like gears and flywheels. It must have high torsional rigidity and lateral rigidity.

2.3.5 DYNAMO: It is a device, which converts mechanical energy into electrical energy. 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 Electromagnetic Induction". A dynamo machine consists of a stationary structure, called stator, which provides a constant magnetic field, and a set of rotating winding called the armature which turns within that field.



Fig.3. Dynamo

2.3.6 BELT & PULLEY ASSEMBLY: Belt and pulley assembly are used to transmit motion from pinion shaft to flywheel shaft.

2.3.7 FREEWHEEL: Freewheel is used to transmit power in one direction only. During downward motion pinion is rotated in one direction but during upward motion of rack, pinion is freed due to which no motion is transmitted.



Fig.4. Freewheel

Sr.No.	Component	Quantity
1	Rack & Pinion	1
2	Pulley	2
3	Belt	2
4	Dynamo	1
5	Shaft	2
6	Bearing	4
7	Metal Sheet	2
8	Coil Spring	1
9	Free Wheel	1

Table.1. Bill of Material

2.4. PROBLEM STATEMENT

Owing to the rising demand of electricity due to rapid industrialization, need for electricity is increasing very rapidly. Power plants though are efficient but could not meet the growing requirement. Thus, there is a need of system which can support the power plant to meet the requirement. So, we develop a model which is non-conventional source of energy which can be used supplementary with power plant and can reduce the dependency on power plant to some extent.

2.5. OBJECTIVE

Our objective behind this project is to make a unit which can solve the problem of energy crisis to some extent and also can support the power plants by reducing the dependency on power plant. Our aim is to reduce energy crisis by using speed breaker unit to develop power in economical and convenient way.

This can be achieved by employing the unit along with speed breakers where there is a heavy traffic like toll plazas, malls, Multiplexes, Traffic signals, Parking areas, etc.

2.6. ADVANTAGES

- Ease in employing because of simple assembly.
- Cost of the unit is comparatively low.
- Maintenance is comparatively low.
- It is non-conventional source of energy.
- Simple model can generate electricity upto 60 watt.
- Model size is small, thus it requires less floor area which is of great importance in metro cities where less area is available and power plant cannot be set up.
- It does not require huge components and transmission lines as it is required in power plants and other such power producing units.
- It doesn't require external source of energy for its operation as it is required in power plants.
- Effective & convenient way of power generation because of its simplicity and easy maintenance.

2.7. DISADVANTAGES

- Capacity of unit is low as compare to power plant unit.
- Load carrying capacity i.e capacity of vehicle passing over it is low.
- Though it requires periodic maintenance, still its maintenance is difficult.
- Its maintenance requires seizing of road causing many traffic problems.
- Effectiveness of the unit depends upon the intensity of the traffic. Thus, it cannot promise fix power supply.
- Stress carrying capacity of the unit is also low.

3. FUTURE SCOPE

As the demand for electricity is increasing day by day due to rapid industrialization & urbanization, load on power plant is increasing rapidly. Due to this, power plant could not meet the requirement of industries as well as domestic

requirement. This has resulted in load shedding problem in many areas. There is insufficient supply of electricity.

To meet this requirement, research are going on to find alternative methods of power generation by using different sources like solar, wind, thermal, tidal, kinetic energy, Geothermal energy etc.

Thus, our project aims at future requirement of electricity by using non-conventional source of energy i.e.kinetic energy of vehicles passing over the speed breaker.

4. LITERATURE REVIEW

The energy crisis is a bottleneck in the supply of energy resources to an economy. The studies to sort out the energy crisis led to the idea of generating power using speed breaker. First to make use were South African people, their electrical crisis has made them to implement this method to light up small villages of the highway. The idea of basic physics to convert the kinetic energy into electrical energy that goes waste when the vehicle runs over the speed-break was used. Since then a lot has been done in this field. The idea caught our working team and we have decided to develop such a project that will produce more power and store it for use at night time as it proves to be a boon to the economy of the country.

Recently several attempts and models have been suggested and tested for harnessing kinetic energy of vehicles via a speed bump. Mechanisms which include springs by A.K. Singh, Deepak S., Madhawendra K. and V. Pandit Rack and Pinion by Aswathaman. V, Priyadharshini.M, Shakun Srivastava , AnkitAsthana in "Produce electricity by the use of speed Breakers" and by Ankit Gupta, Kuldeep Chaudhary & B.N Agrawal in "An Experimental study of Generation of Electricity using Speed Breaker". Slider crank by Noor Fatima and Jiyaul Mustafa in "Production of electricity by the method of road power generation" have been suggested for producing electricity. Electrodynamics based models by Ankita and MeenuBala in "Power generation from speed breaker" have also been suggested, but are not only expensive to fabricate but involve complicated calculations and can't be used a large scale very easily. Totaram uses a platform plate which is kept inclined on a raised base level to allow vehicles to pass over the raised surface. This system will not work till a vehicle passes on roadway.

5. CONCLUSION

Since, today electricity crisis is increasing rapidly so we have to develop a non conventional power producing unit which can overcome the crisis of electrical energy, which can use the waste energy i.e kinetic energy of vehicle due to the friction between tyre of vehicles and road. This will support the power generating method and will tackle the problem of energy crisis to some extent.

Various studies conclude how this energy gets wasted if we do not employ such a unit near a speed breaker. Also how effective this can be converted to electricity. Works of various personalities conclude the importance of such a non-conventional source of electricity keeping future requirements in mind.

6. ACKNOWLEDGEMENT

We express esteemed gratitude and sincere thanks to our worthy lecturer guide **PROF. PANKAJ SINGH** whose vocabulary do not have suitable words benefiting to high standard of knowledge and extreme sincerity, devotion and affection with which they have regularly encouraged us to put heart and soul in this work.

We are also thankful to our **H.O.D. PROF. LAYAK SAIYAD** whose advices and kind co-operation wrought out through discussion provide for completion of this project and also thanks to our workshop superintendent and all the Assistants, who helped a lot, for completion of this project. We also convey great thanks to our Honorable **Principal DR. N.K. RANA** who helped a lot for completion of this project.

Our parents and relatives who always bear with us in very critical situations have contributed a great deal in making this for us. As we give expression to our love and appreciation for them our hearts are filled.

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