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SIMULATION OF POWER GENERATION USING SPEED BREAKERS MECHANISM

Yash Chaukse[1], Shantanu Deshmukh[2], Aditya Badgujar[3]

[1]Yash Chaukse School of Mechanical Engineering, Dr. Vishwanath Karad World Peace University Pune
[2]Shantanu Deshmukh School of Mechanical Engineering, Dr. Vishwanath Karad World Peace University Pune
[3]Aditya Badgujar School of Mechanical Engineering, Dr. Vishwanath Karad World Peace University Pune

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ABSTRACT-

Nowadays, power is the primary need for the survival of human life. Researches shows that large amount of power is generated from non-renewable energy resources compared to that of renewable energy resources. The extensive usage of available resources in recent years created a demand for the future generation. To overcome this problem we need to utilize renewable energy sources for power generation and conservation. Beneath speed breaker, setting up an electro-mechanical unit known to be power hump, could help in conserving wasted kinetic energy and use it for power generation. This generated power can be stored, by using different electrical devices and supply this energy to street lights, traffic lights, and nearby areas. In this project it is mainly focused to provide the detailed survey of power generation mechanism from renewable energy resources by making an analysis on the Roller mechanisms. By using the softwares like Solidworks 2015 for modeling of the mechanism, ANSYS for Analysis and MATLAB Application for Convertor circuits and outputs are done. This gives a details view of the mechanism generated more power output by using less weight and low cost material for its manufacturing in an efficient way with more efficiency and less maintenance. After analysis of the mechanism through software, for the proposal of implementation of the project in the society which will be very useful in the future.

KEYWORDS: Power generation, Speed breaker, Roller mechanism, Boost convertor, Dynamo,Gears.

1. INTRODUCTION:

In today's world, almost every equipment requires electricity for its working and the demand for the electricity is increasing in many folds. In this project, studies available conventional methods for the generation of electricity from the wasted energy. The number of vehicles passing over the speed breaker in roads is increasing .Due to this a large amount of energy is wasted daily on the speed breaker through the friction between the speed breakers and the vechicle tires during vehicle passes. There is possibility of storing this energy by making power generating system under speedbreaker.The power thus generated is stored in a rechargeable device such as battery (conservation) for future use (conversion). Generating electricity by speed breakers is an innovative and useful concept. It is an attractive technology for optimal use of available sources This project aims to compare all the existing power generation mechanism to make the best mechanisms which can give the better power with more efficiency. And providing further information to improve the output of the other mechanism.

2. SCOPE:

The usage of the energy is an indication of the development of the nation. A recent survey on the energy consumption in India had published a pathetic report that 55,000 villages in India do not still have electricity. The main problem is the population the demand is not equal to the supply. The 300 million people in india is using power but the power produced is not always less than the power used. Many generating stations were idle due to the fuel and political problem and other crisis. India as 46 lakhs kilometer road in it.And it is second largest road network in the world. In these road we normally have speed breakers as already said we can store the energy that produced in the battery and we can use the power for street lights, signals.

3. LITERATURE SURVEY:

3.1

THE BURGER KING ON U.S. HIGHWAY, CUSTOMERS PULLS IN AND OUT ALL DAY, AND AT LEAST 100,000 CARS VISIT THE DRIVE-THRU EACH YEAR. AND A NEWLY INSTALLED, MECHANIZED SPEED BUMP(VIDEO) WILL BOTH HELP THEM SLOW DOWN AND HARVEST SOME OF THAT COASTING ENERGY.

3.2

JOURNAL OF ENGINEERING RESEARCHANDSTUDIES.PRODUCE ELECTRICITY BY THE USE OF SPEED BREAKERS. ASWATHAMAN.V, ELECTRONICS AND COMMUNICATION ENGINEERING SONA COLLEGE OF TECHNOLOGY, SALEM, INDIA

3.3

OURNAL OF ENGINEERING RESEARCH AND STUDIES.PRODUCE ELECTRICITY BY THE USE OF SPEED BREAKERS SHAKUN SRIVASTAVA, ANKIT ASTHANA, DEPARTMENT OF MECHANICAL ENGINEERING, KANPUR INSTITUTE OF TECHNOLOGY, KANPUR

4. PROBLEM STATEMENT:

SIMULATION OF POWER GENERATION FROM SPEED BREAKERS USING ROLLER MECHANISM.

The demand of electricity is increasing rapidly day by day but the production rate is not according to the needs. Establishing new power plants to produce more electrical energy is not a solution 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 existing huge gap between demand and production can be filled by producing electricity at individual level in order to meet various household needs.

To generate electricity to satisfy daily or basic needs various sources can be used that are normally overlooked in daily life, one of these sources include mechanical pressure of vehicles on speed breaker.

5. OBJECTIVE:

The generation of electricity using speed breaker is one of the easiest ways 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.

6. SCOPE:

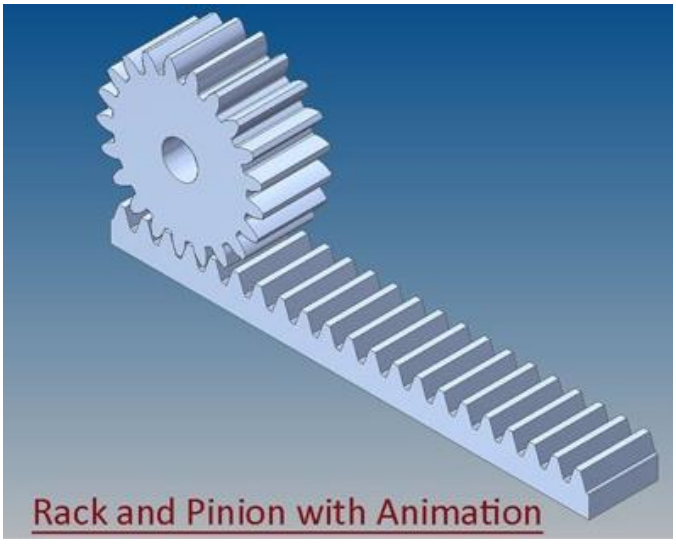
- It can be utilized to generate power at parking of Malls, Hospitals, Docks, Warehouse of companies, Tolls and Signals etc.
- Used in Industries situated near a highway.
- The 300 million people in India is using power but the power produced is always less than the power used.
- In these roads we normally have speed breakers as already said we can store the energy that produced in the battery and we can use the power for street lights, signals.

6. METHODOLOGY OF WORKING:

When a car reaches on speed breaker, rack moves downward to generate linear motion. Two pinions are attached to a rack which converts the linear motion of rack into rotary motion. Both pinions have unidirectional motion, like as bicycle sprocket. Two gears are mounted on pinion shafts to transfer mechanical power to the common shaft having one gear. At final shaft, a flywheel is used to provide uniform motion. A belt is used to transfer mechanical motion of the common shaft to DC generator. The complete gear box is dipped in lubrication oil sump to minimize frictional losses. There are no chances of slipping between rack and pinions due to guide slots. DC generator generates DC power which is stored in batteries same as in solar technology. The generated power can be used for the domestic purpose or commercially, which are present near the speed breaker.

6.1 RACK AND PINION MECHANISM:

Rack and pinion steering works by using a gear system to translate the steering wheel's circular motion into the linear motion needed to turn the wheels. A metal tube houses the gearset. The tube has openings on each end to allow the rack to attach to an axial rod. The pinion gear connects to the steering shaft so that the gear will spin and move the rack when the steering wheel turns. The axial rods connect to a tie rod end, which attaches to the spindle.



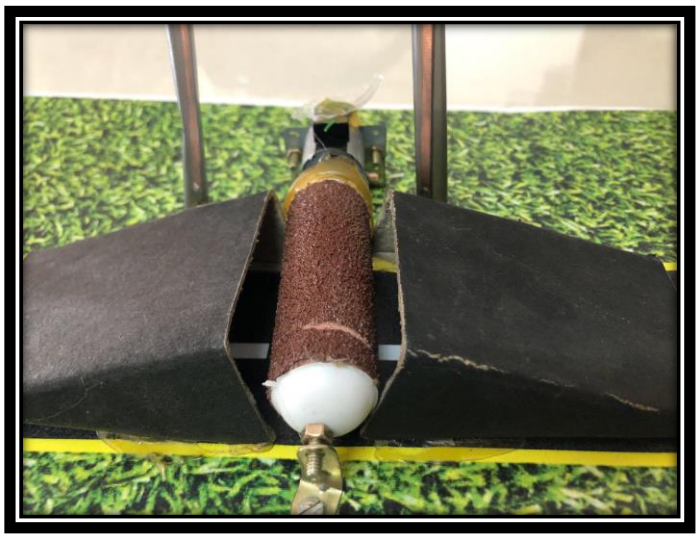
7. PROTOTYPE WORKING MODEL:

7.1 COMPONENTS OF PROTOTYPE:

7.1.1 D.C GENERATOR:

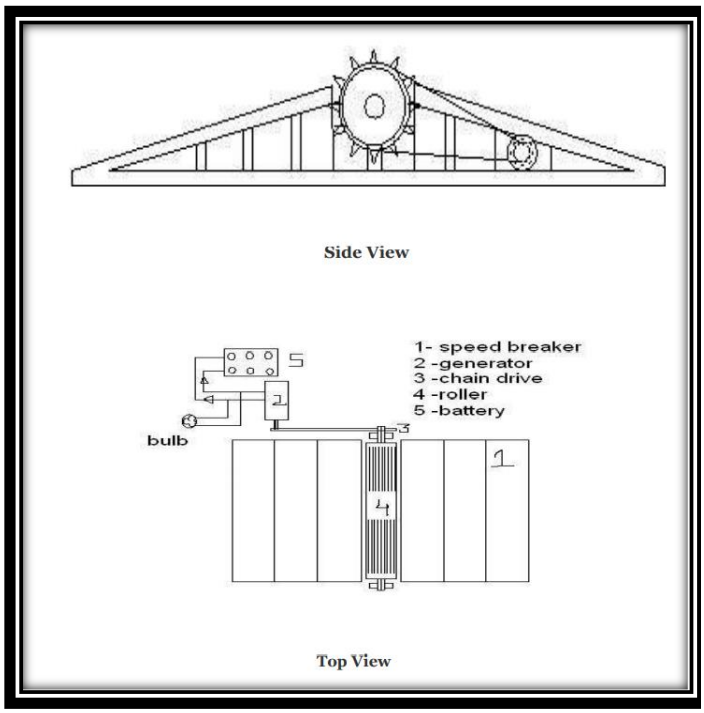
A DC generator is the type of electrical generator that converts mechanical energy into direct current electricity. Here, energy conversion is based on the principle of dynamically induced EMF production.

7.1.2 SPEED BREAKER:



Speed bumps or speed breakers are important for road safety. A speed breaker is anything that can slow down your vehicle's speed.

8. BASIC DRAWING:



Basic drawing of the structure of prototype working model which includes components such as DC generator, Speed breaker, Roller, Battery, Chain Drive and a Generator.

9. STUDY AND RESULTS:

Consider 100 cars of mass 500kg pass over a speed breaker in an hour. The height of rack is 20cm, the diameter of the final pulley is 18mm and having revolution speed (N) is equal to 37 RPM. Down word motion of speed breaker is due to the weight of moving the vehicle and upward motion of speed breaker is take place due to the utilization of energy from springs. Each car pushes speed breaker two times.

Force = m*g

The mass of vehicle = 500kg (approximately)

Height = 20 cm

Force = Mass × gravitational constant

Here, Force = 500 kg × 9.81 = 4900 N

Work Done= Force*Distance

Distance = Height = 20 cm

Power = work done/second = (4900×0.20)/60 = 16.33 watts

This is the output power developed per vehicle passing over the speed breaker arrangement for one minute = 16.33 watts

Power developed for one hour = 979.8 watts

Power developed for a day = 23.51 KW

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

10. ELECTRICITY GENERATION FROM ROLLER MECHANISM:

Before starting I have one question to you all who is really very happy with the current situation of the electricity in India? I suppose no one. so this is my step to improve the situation of electricity with a innovative and useful concept ie Generating Electricity from a Speed breaker First of all what is electricity means to us? Electricity is the form of energy. It is the flow of electrical Power . Electricity is a basic part of nature and it is one of our most widely used forms of energy. We get electricity, which is a secondary energy source, from the conversion of other sources of energy, like coal, natural gas, oil, nuclear power and other natural sources, which are called primary sources. Many cities and towns were built alongside water falls that turned water wheels to perform work. Before electricity generation began slightly over 100 years ago, houses were lit with kerosene lamps, food was cooled in iceboxes, and rooms were warmed by wood-burning or coal-burning stoves. Direct current (DC) electricity had been used in arc lights for outdoor lighting. In the late-1800s, Nikola Tesla pioneered the generation, transmission, and use of alternating current (AC) electricity, which can be transmitted over much greater distances than direct current. Tesla's inventions used electricity to bring indoor lighting to our homes and to power industrial machines. How is electricity generated? Electricity generation was first developed in the 1800's using Faradays dynamo generator. Almost 200 years later we are still using the same basic principles to generate electricity, only on a much larger scale. The rotor(rotating shaft) is directly connected to the prime mover and rotates as the prime mover turns. The rotor contains a magnet that, when turned, produces a moving or rotating magnetic field. The rotor is surrounded by a stationary casing called the stator, which contains the wound copper coils or windings. When the moving magnetic field passes by these windings, electricity is produced in them. By controlling the speed at which the rotor is turned, a steady flow of electricity is produced in the windings. These windings are connected to the electricity network via transmission lines. POWER GENERATION USING SPEED BREAKERS 79 Now I m throwing some light on the very new and innovative concept ie GENERATING ELECTRICITY FROM A SPEED BREAKER . Producing electricity from a speed breaker is a new concept that is undergoing research. The number of vehicles on road is increasing rapidly and if we convert some of the kinetic energy of these vehicle into the rotational motion of roller then we can produce considerable amount of electricity, this is the main concept of this project. In this project, a roller is fitted in between a speed breaker and some kind of a grip is provided on the speed breaker so that when a vehicle passes over speed breaker it rotates the roller. This movement of roller is used to rotate the shaft of D.C. generator by the help of chain drive which is there to provide 1:5 speed ratio . As the shaft of D.C. generator rotates, it produces electricity. This electricity is stored in a battery. Then the output of the battery is used to lighten the street lamps on the road. Now during daytime we don?t need electricity for lightening the street lamps so we are using a control switch which is manually operated .The control switch is connected by wire to the output of the battery. The control switch has ON/OFF mechanism which allows the current to flow when needed.

One question that u all are thinking is why I have apply this on the speed breaker and not on the rough road or plane road where the kinetic energy of the vehicle is more then what I m getting on the speed breaker I m giving u one example, just think over it. A car or any heavy vehicle is coming with a speed of 100 mph on the road and passing over this roller which is fitted at the level of the road then this roller is gaining the speed nearly somewhere 90 mph (due to losses). So now suppose a cycle is coming with a speed of 20 mph and is going to pass this roller (which is moving at a speed of 90 mph) due to this difference in the speed there will be a collision that is the main reason for using this concept on the speed breaker.

11. IMPROVEMENTS:

- More durable plumber bearings can be used for replacing bearings for reducing the chance of failure.
- The rollers materials can be made lighter to increase efficiency.
- To reduce the shocks and vibration, V-belt drive can be used instead of chain drive.
- To provide better grip between the tires and the rollers, rollers with plain rubber can be replaced by a material with coarse texture.

12. ADVANTAGES:

- No obstruction to traffic
- It is simple in operation.
- It is simple in operation.
- Free from all types of pollutions.
- It is economical and easy to install.
- No fuel transportation problem.
- No consumption of fossil fuel which is non-renewable.

13. DISADVANTAGES:

- Selecting suitable generator.
- Selection of suitable Springs.
- Achieving proper balance of speed and torque.
- Might require to be covered at the time of heavy rainfall.

14. SUMMARY:

In this project we discover a technology to generate electricity from speed breakers which is reliable and obviously will help to save our natural resources. Since, lot of electricity of power plants. Due to over population, the power generation has become insufficient to fulfill our requirements. This project can help to solve energy crisis very easily. The test should be done on a busy road such as Dispatch areas of industries, Parking of hospitals, Busy roads at toll and drive thru commercial areas.

This concept is so important & here the reason behind this:

- Power generation with low cost.
- Environment friendly power generation.
- Comparatively less floor area required.
- Man power is not necessary.
- The initial cost of this arrangement is high but after the first cost, it will be free energy system.
- Not much skilled people are required.

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