

Generation of Electricity through Speed Breaker Mechanism

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-----ABSTRACT-----

In the current scenario demand of power is increasing day by day with increasing population. On the other hand energy crisis is also a main issue of today's life and all there is a shortage of conventional energy resources due to its large usage. So, we have to sort out this problem with a technique which will not only overcome this energy crisis but also should be eco-friendly. Many conventional resources are creating pollution so that's why focus is towards eco-friendly solution. This project emphasizes on idea which shows that power could be generated by specially designed speed breakers. A large amount of kinetic energy is being wasted on roads on daily basis in different forms which could be use to generate power and this power can be stored in batteries. This project shows clearly how we can generate power by using rack-pinion method where basically linear motion is converted into rotary motion and then can be used to generate electricity. Large amount of electricity can be generated using this method and this method is eco-friendly.

Keywords: energy crisis, kinetic energy, power production, speed breakers.

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I. INTRODUCTION

Energy crisis is one of the main problems and issues which are under focus these days. We have shortage of conventional resources of energy and most conventional resources like fossil fuels etc are not eco-friendly and also cause pollution. Now it's time to move towards solution of energy crisis with the factor in mind that solution should be eco-friendly. As population of the world increasing rapidly, vehicles which are related to population are also increasing on roads. When vehicle passes over the road a large amount of energy is being wasted in different forms e-g friction, kinetic energy. We can make use of this energy and could generate power. In back days this method was of not much importance because relatively energy wasted on roads was not much but now due to high population and high traffic on roads this wasting energy is of much importance and should be focused upon. Specially designed speed breakers could be implemented on roads which can generate power when any vehicle passes over them. When vehicle passes over the speed breaker it presses it down and due to Rack-Pinion this linear motion is converted into rotary motion and then this rotary motion can be used to operate DC generator to produce electricity. Batteries are used to save the energy and DC could be converted into AC using inverter. This project could be implemented on roads where there is heavy traffic. As an example, according to statistics provided by the Provincial Excise & Taxation Departments, Government of India, there is a heavy vehicular growth as shown in Figure 1;

There were approximately 4.78 million vehicles on roads in 2001 and this figure reached to 7.86 million in 2010. So we can use this opportunity and energy to generate power. In order to solve this problem of energy crisis a project is made by us, which is using speed breaker to produce electricity. A special proto-type of speed breaker was made by us and was implemented on the road and under speed breaker. Rack-Pinion mechanism was used in this project. When vehicles passes over these specially designed speed breakers then due to rack pinion linear motion is converted into rotary motion. Rotary motion then can be used to rotate the shaft of dynamo or generator. Power generation by this method has many advantages because it is eco-friendly method and generation is throughout the year.

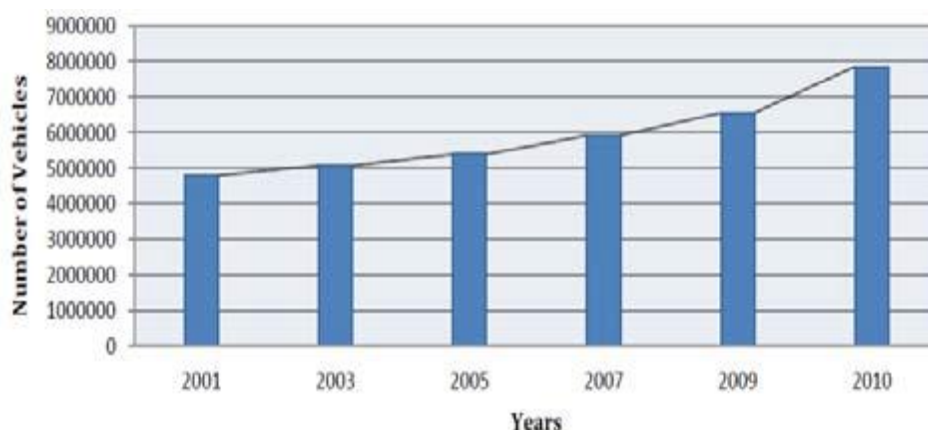


Figure 1: Traffic density in India in Last decade[1]

This paper completely describes the method and working of power generation using speed breakers. In first section there is an introduction related to power generation using speed breakers. In second section literature review is represented regarding this project. Third section illustrates methodology and working of project. In fourth section results are elaborated and output power calculations are shown. In last section conclusion and some future directions are given.

II. LITERATURE REVIEW

As identified by Aswathaman [2], three different mechanisms are currently being used in power generation via speed breakers. These are: Roller type mechanism [3,4], the Rack- Pinion mechanism [2,5], Crank-shaft mechanism[6].

Singh et al. [7] discussed rack pinion mechanism to generate electricity. They proposed mechanism using chain sprocket and springs with rack pinion to generate electricity. Vehicle was passed over that mechanism and then due to rack pinion there was rotation in gears and shafts moved with chain sprocket movement. Dc power was generated and was stored in a battery and then using an inverter they changed that dc in ac power.

Das et al. [8] proposed mechanism in which electricity was produced by kinetic energy of speed breaker. The basic principle was when a car passes over the jump or dome which is the device use in place of jump the dome will go down due to weight of car while moving car possess kinetic energy that kinetic energy will be converted into rotational energy with the help of rack and pinion. A fly wheel was mounted on the shaft whose function was to make energy uniform. That shaft is connected through a belt with dynamos. These dynamos were used to convert mechanical energy in electrical energy. The power was generated in both directions. They used Zener diode to generate power in opposite direction too.

III. METHODS TO GENERATE ELECTRICITY THROUGH ROAD RIBS

Electricity generating road rib is a conceptual design that makes use of the wasted yet available energy procured from the unused energy that has not been converted from the vehicle fuel. A moving vehicle makes the rib move as well, which helps generate new renewable energy. The methods to generate electricity through road ribs are as follows:

1. Using Crank-shaft mechanism
2. Using Roller mechanism
3. Using Rack- Pinion mechanism
4. By moving wind mill through the high velocity springs downside the road air due to pressure difference produced by
5. By moving a magnet in a coil under the road ribs

IV. PRINCIPLE OF WORKING

The principle of the electric power generation using speed breaker mechanism is very simple. It is based on the same principle as in the case of electricity generation in case of hydroelectric power plant, thermal electric power plant, nuclear power plant, geothermal energy, wind energy, tidal energy etc. In all of the above power plant mechanical energy is converted into electrical energy. In this setup also mechanical energy is converted into electrical power using a D.C. generator. Here the vertical motion of the top of the speed breaker is converted into the rotational motion, which in turn rotates the generator and generates electricity.

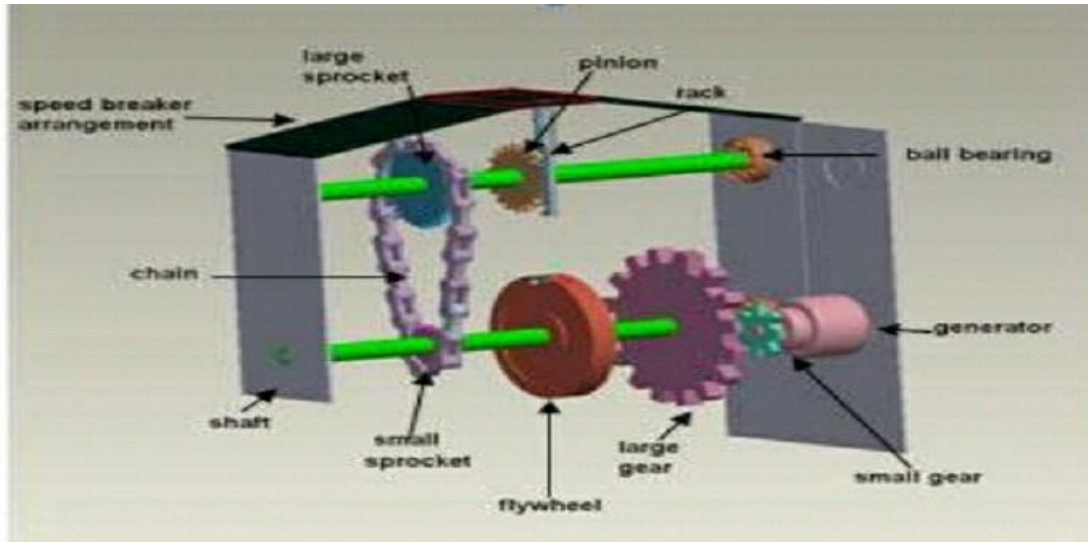
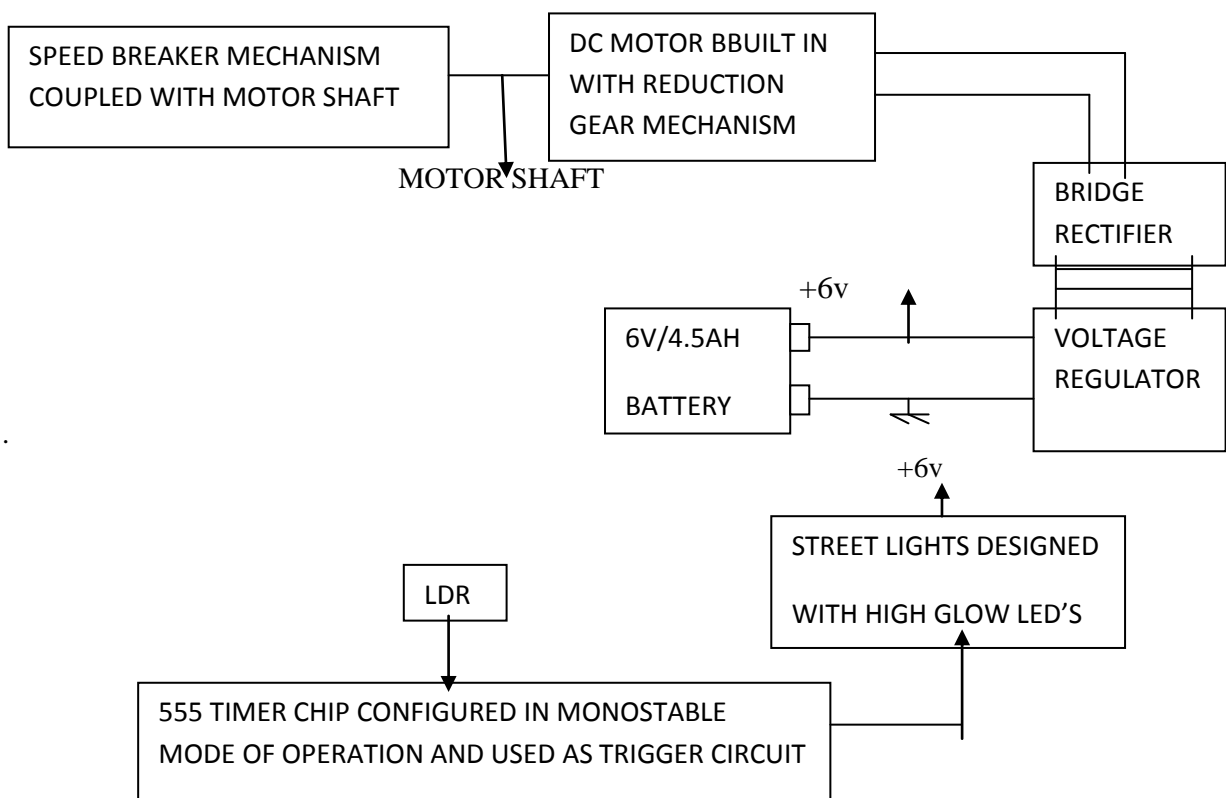


Figure 2: constructional details

V. BLOCK DIAGRAM



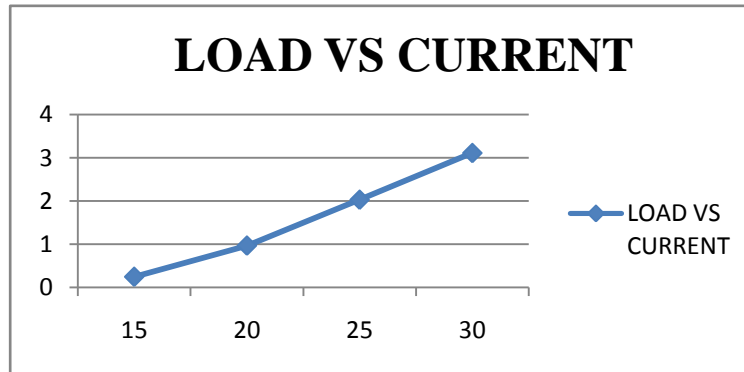
VI. THEROTICAL CALCULATIONS

Let us consider,
 The mass of a vehicle moving over the speed breaker = 30Kg
 Height of speed brake =5 cm
 Work done=Force x Distance
 Where ,
 Force = Weight of the Body
 = 30 Kg x 9.81m/s²

n= 294.3 N
 Distance travelled by the body = Height of the speed brake =5 cm
 Output power= $(294.3 \times 0.05)/60$
 = 0.24525 Watts (For One pushing force)
 Power developed for 1 vehicle passing over the speed breaker arrangement for one minute
 = 0.24525 watts
 Power developed for one hour =14.715 watts
 Power developed for one day = 0.35316 kw

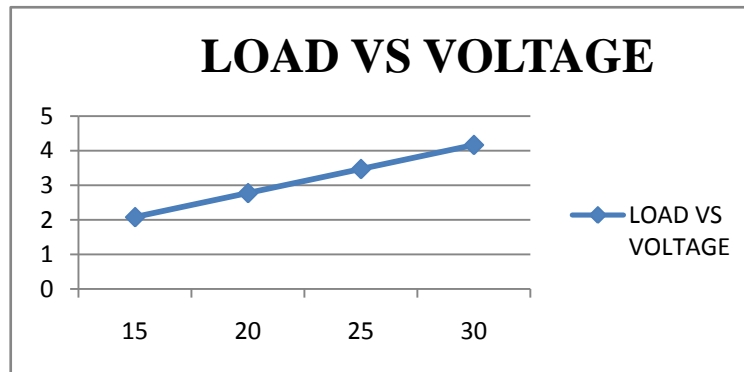
VII.GRAPH PLOT BETWEEN LOAD AND CURRENT

LOAD (Kg)	CURRENT (mA)
15	0.25
20	0.97
25	2.03
30	3.11



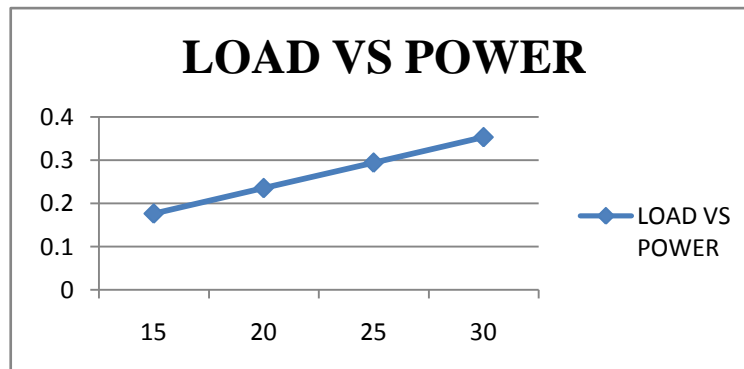
VIII.GRAPH PLOT BETWEEN LOAD AND VOLTAGE

LOAD (Kg)	VOLTAGE (V)
15	2.0825
20	2.776
25	3.47
30	4.164



IX. GRAPH BETWEEN LOAD AND POWER

LOAD (Kg)	POWER (Kw)
15	0.17658
20	0.23544
25	0.29430
30	0.35316



X. PROJECT DESIGN



XI. ADVANTAGES

Power generation with low cost and using non-conventional energy sources which will help us to conserve the conventional energy sources to meet the future demand.

1. By using this method, electricity will be generated throughout the year without depending on other factors.
2. Easy for maintenance and no fuel transportation problem.
3. Pollution free power generation.
4. Less floor area required and no obstruction to traffic.
5. No need of manpower during power generation.

XII. APPLICATIONS

The generated power is stored in the battery; one can use this charge to various purposes. Mainly the generated power is used in two aspects.

Street Lights

A Street light, lamppost, street lamp, light standard, or lamp standard is a raised source of light on the edge of a road or walkway, which is turned on or lit at a certain time every night. Modern lamps may also have light-sensitive photocells to turn them on at dusk, off at dawn, or activate automatically in dark weather.

Traffic Lights

Traffic lights, which may also be known as stoplights, traffic lamps, traffic signals, signal lights, robots or semaphore, are signaling devices positioned at road intersections, pedestrian crossings and other locations to control competing flows of traffic.

XIII. CONCLUSION

"Electricity plays a very important role in our life". Due to population explosion, the current power generation has become insufficient to fulfill our requirements. In this project we discover technology to generate electricity from speed breakers in which the system used is reliable and this technique will help conserve our natural resources. In coming days, this will prove a great boon to the world, since it will save a lot of electricity of power plants that gets wasted in illuminating the street lights. As the conventional sources are depleting very fast, it's high time to think of alternative resources. We got to save the power gained from the conventional sources for efficient use. So this idea not only provides alternative but also adds to the economy of the country

XIV. ACKNOWLEDGEMENT

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REFERENCES

- [1] Ahmad Syed Arslan, Bilal Masood. Power Scavenging from Moving Vehicles on Road. *International Journal of Innovation and Applied Studies*. 2014; 9(4): 1428.
- [2] L. Gu, C. Livermore, Passive self-tuning energy harvester for extracting energy from rotational motion. *Appl. Physics* pp. 97, 2010.
- [3] S. Shakun, A. Ankit, Produce Electricity by the Use of Speed Breaker. *Journal of Engineering Research and Studies*, Article 30, Volume 2, 2011.
- [4] G. Ankit, B. Meenu, Power Generation from Speed Breaker. *Int. J. of Advance Research in Sci. and Engineering*, Volume 2, Issue 2, 2013.
- [5] F. Noor, M. Jiyaul, Production of Electricity by the Method of Road Power Generation. *Int. J. of Advances in Electrical and Electronics Engineering*, Volume 1, 2011.
- [6] K. Gogoi, Generation of electricity from speed breaker using crank shaft mechanism, thesis submission www.scribd.com, 2010.
- [7] Singh Alok Kumar, et al. Generation of Electricity through Speed Breaker Mechanism. *International Journal of Innovations in Engineering and Technology IJIET*. 2013; 2(2): 20-24.
- [8] Das CK, Syed Monowar Hossain, MS Hossain. *Introducing speed breaker as a power generation unit for minor needs*. Informatics, Electronics & Vision (ICIEV), 2013 International Conference on IEEE. 2013.