

# A Revolutionary Technique of Power Generation Through Speed Breaker Power Generators

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## 1. Abstract

Electricity in India is a big problem which is faced by people, who reside in the country. Electricity is the form of energy. It is a basic part of nature and 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. Electricity generation was first developed in the 1800's using Faraday's dynamo generator. Almost 200 years later we are still using the same basic principles to generate electricity, but on a much larger scale. Above mentioned primary energy resources are the conventional and are in limited quantity, and on the other hand create a lot of pollution in atmosphere, a new technique of power generation is introduced here, i.e. through speed breaker power generators. Generating electricity by speed breakers is an innovative and useful concept. As on speed breakers tremendous amount of energy get wasted by vehicles, to utilize this energy through speed breakers, a lot of models were introduced. This paper attempt to show the different techniques (in fact almost all kind of mechanism) of utilization of energy through speed breaker with their limitations.

## 2. Keywords

Speed breaker, power generation, energy, chain drive, gears, cam and follower, stator- translator, topology.

## 3. Introduction

On June 7, 1906, The New York Times reported on an early implementation of what might be considered speed bumps in the U.S. town of Chatham, New Jersey, which planned to raise its crosswalks five inches above the road level: "This scheme of stopping automobile speeding has been discussed by different municipalities, but Chatham was the first place to put it in practice"

According to statistics provided by the Ministry of road Transport & Highways, in India the lengths of national highway till year 2012 was 76,818 km and 15-20(on average) highways are there in each state. In year 2002, 58.8 million and in 2004, 72.7 million vehicles were playing on Indian roads. The annual rate of growth of motor vehicle population in India has been almost 10 percent during the last decade <sup>[9] [11] [13]</sup>. There is tremendous vehicular growth in India year by year. On Road these vehicles waste tremendous amount of energy due to speed breakers, the increasing traffic and number speed breakers on roads motivate to manufacture an innovative device which can channelize the energy of vehicles that is wasted on speed breakers to some useful work.

Many models were introduced according to condition. After each generation the efficiency of model increased and the limitations diminished. Different-different models have variant designs,

with use of gears, belts, dynamos etc with different application at different places has introduced. Each model was encouraged due to limitations of previous one. This paper includes almost all the models and will give the review of different technologies used in generation of energy with the help of speed breakers.

### 3.1. Why only speed breakers

Now the question arises why only the speed breaker is used and not the rough road or plane road where the kinetic energy of the vehicle is more than what is getting on the speed breaker for answer to this question let's look on one example: 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 bicycle 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 <sup>[7]</sup>.

### 3.2. Energy estimation

When the vehicle moves over the speed breaker, speed breaker reduces its speed. As these breakers have a little height it gains an increase in its potential energy. A vehicle weighing 1,000kg

passes over the system it pushes the damper to a depth of 10 cm it can produce approximately 0.98 kilowatt power (ideally). So from one such speed breaker on a busy highway, where about 100 vehicles pass every minute, about one kilowatt of electricity can be produced energy single minute. This paper needs a lot research work as it can be proved a non-conventional resource of energy. While moving, the vehicles possess 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<sup>[2]</sup>.

The amount of electricity consumed in one night by all the street lights around Chennai city (India) is equal to consumption of electricity in a remote village for one month and 14 days<sup>[5]</sup>.

The design of speed breakers was developed by the generations and utilized by few nations only, as there were limitations of speed breaker power generators.

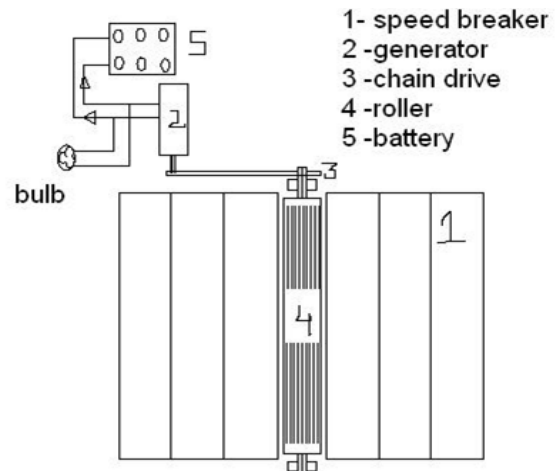
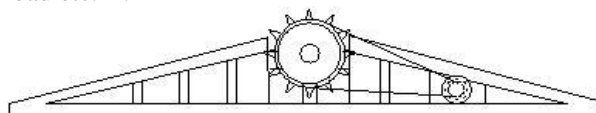
These power generators can be classified according to their mechanism and the type of power generate through it. Its classification is mentioned below.

#### 4. Classification of speed breaker power generator

As a single design of power generation is not suitable for all the road condition different-different designs were introduced.

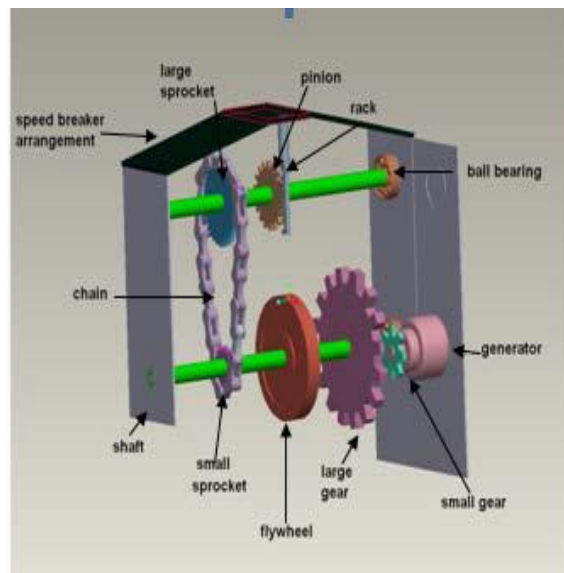
##### 4.1. Connection through chain drive mechanism

When the vehicle will come on the speed breaker because of its weight the top portion of the speed breaker moves down wards and the shaft consisting of the U portion rotated in a particular direction. Due to this rotation of the shaft, the sprocket will rotate and the rotational energy from one shaft is transferred to the other shaft with the help of chain drive mechanism. This rotates the gear on the bottom shaft, which in turn will help to rotate the gear placed on motor. This rotation of the gear starts the generator and generates electricity which can be stored in the battery and can be converted in A.C. current using inverter and can be used for lighting of the lamps signals sign boards on the road etc.<sup>[1]</sup>.



##### 4.2. Through rack and pinion system

The project is concerned with generation of electricity from speed breakers-like set up. The load will acted upon the speed breaker & further the load will transmitted to rack and pinion arrangements. Here the reciprocating motion of the speed-breaker is converted into rotary motion using the rack and pinion arrangement. The axis of the pinion is coupled with the sprocket arrangement. The sprocket arrangement is made of two sprockets. One of larger size and the other of smaller size. Both the sprockets are connected by means of a chain which serves in transmitting power from the larger sprocket to the smaller sprocket. As the power is transmitted from the larger sprocket to the smaller sprocket, the speed that is available at the larger sprocket is relatively multiplied at the rotation of the smaller sprocket<sup>[4]</sup>.



**4.3. Direct use of load**

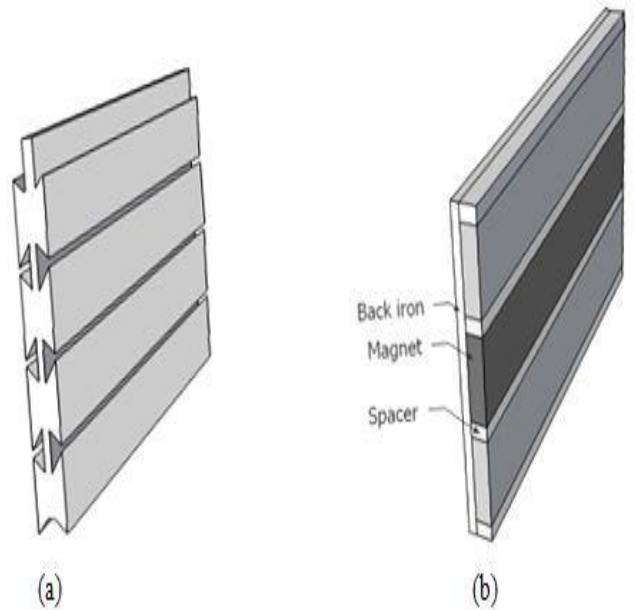
The load can be directly used by using reciprocating device .It may be done with the help of shafts and spring as horizontal rod connected with shaft at its centre and springs at its both ends .this mechanism will give it a reciprocating motion and hence power can be generated .This motion is used to compress the air using compressing device and after compression, the air get collected in a cylinder and further can be used<sup>[5]</sup>.



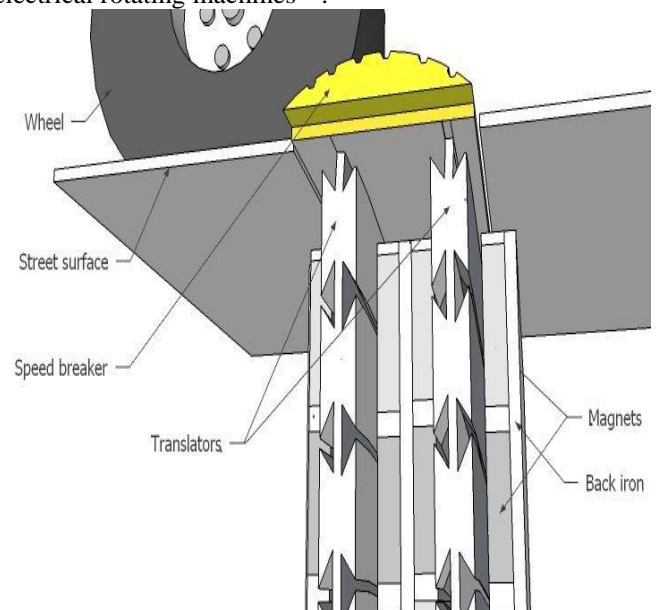
**4.4. Use of translator and stator topology**

**(a) Translators.** Each translator is a double slotted planar plate. The translator is wound as three-phase connection winding. The generated power in the translators is delivered to output terminals of generator using flexible wires

**(b) Stator.** The stator is a planar back iron with mounted magnets on it. The arrangement of magnets is N-S-N There is a spacer with high permeability between each two adjacent magnets.

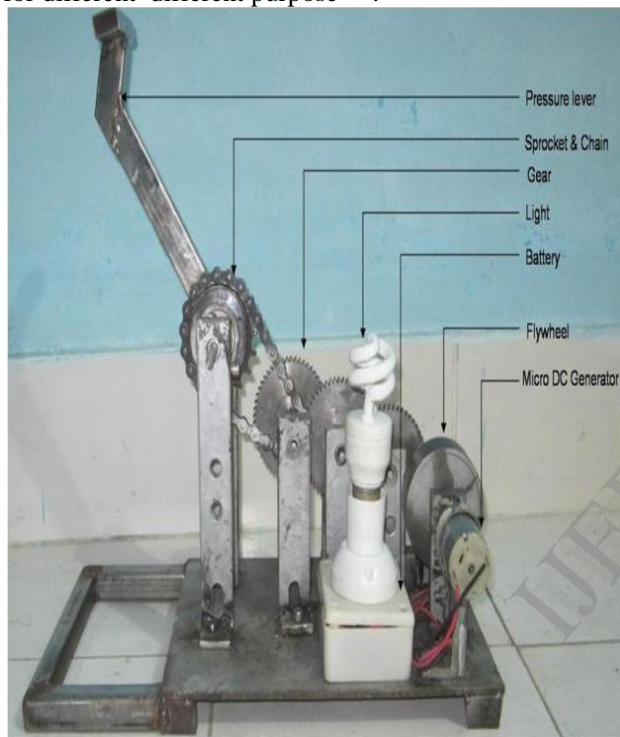


The operation principle of the SBG (speed breaker generators) can be described as follow. As the vehicle wheels pass the SBG, the translators will be pushed down. Since the magnets have provided a high density magnetic field in the air-gaps, motion of translators cause to induction of voltage in translator's windings. The produced power will be transferred via the flexible wires to output terminal of generators. It should be noted that, the flexible wires can be interpreted as brush and slips ring in electrical rotating machines<sup>[6]</sup>.



#### 4.5. Use of pressure through lever mechanism

When pressure lever is pressed the flywheel will rotate by chine sprocket gear mechanism, it will force to rotate the DC generator because DC generator and flywheel are in same shaft. DC generator will produce electricity by the rotation of armature coil and generated electricity will be stored in a rechargeable battery. A rechargeable battery, storage battery, or accumulator can be used as storage device .This electricity can be used later for different–different purpose<sup>[10]</sup>.



It can be seen in different design that the storage devices are used according to convenience of situation, as it simply depends upon the need that which form of energy is require may be need of electricity either in form of direct current<sup>[1]</sup> or in the form of alternating current<sup>[1]</sup>. The power also may store in the form of compressed air as mentioned above in 4.3.

#### 5. Advantages of using speed breaker as power generator

- Require simple construction methods.
- Free from all types of pollutions.
- It is economical and easy to install.
- Maintenance cost is low.
- This concept is quite promising due to its good efficiency as well as energy recovery criteria.

- No fuel transportation problem.
- No consumption of fossil fuel which is nonrenewable.
- No manual work necessary during generation.
- Energy available all year round.
- We can use it at all places according to desired design.

IIT Guwahati has evaluated the machine and recommended it to the Assam ministry of power for large scale funding. IIT (Indian Institute of Technology) design department says it is a 'very viable proposition' to harness thousands of mega watts of electricity untapped across the country every day. A storage module like an inverter will have to be fitted to each such rumble strip to store this electricity. *The cost of electricity generation and storage per mega watt from speed-breakers will be nearly Rs 10 million as opposed to about Rs 80 million in thermal or hydro power stations*<sup>[8]</sup>.

#### 6. Challenges

- Selecting suitable generator.
- Selection of springs.
- Achieving proper balance of speed and torque.
- Such speed breakers can be designed for heavy vehicles, thus increasing input torque and ultimately output of generator & hence it will not work with light weight vehicle.
- Require more suitable and compact mechanisms to enhance efficiency.
- We have to check mechanism from time to time in short span of period.
- Because of Rain water it may get damage.

#### 7. Conclusion

In the coming days, demand of electricity will be very high as it is increasing every day, speed breaker power generator will prove a great boon to the world Future. Aim of this research is to develop the world by enriching it in utilizing its sources in more useful manner. Any country can only develop when it uses power supply frequently and not by getting breakdown in middle course of time. Now time has come for using these types of Innovative ideas and it should be brought into practice. It is suggested that further developments should be done for above mentioned challenges. This project can also be modified by using camshaft and pulley

system or concepts of fluid mechanics can be used instead of gears, so that complexities and difficulties faced during the project would get minimized. By using the concept of power generation new ideas should be introduced which would help in reduction of friction and increase the generator's efficiency.

## 8. References

[1] Alok Umar Singh, Deepak Singh, Madhawendra Kumar, Vijay Pandit, Prof. Surendra Agrawal, "Generation of Electricity Through Speed Breaker Mechanism", Satyam Education & Social Welfare Society Group of Institution Bhopal, International Journal of Innovations in Engineering and Technology vol.2 issue 2, April, 2013.

[2] Ankita and Meenu Bala, "Power Generation from Speed Breaker", International Journal Of Advance Research in Science and Engineering, Vol. No.2, Issue No. 2, February, 2013 ISSN-2319-8354(E).

[3] Ashok Kumar Sharma, Omkar Trivedi, Umesh Amberiya and Vikas Sharma, (YIT, Jaipur, India) "Development of Speed Breaker Device for Generation of Compressed Air on Highways in Remote Areas", International Journal of Recent Research and Review, Vol. I, March 2012 ISSN 2277 – 8322.

[4] Aswathaman.V, Priyadarshini, Electronics and Communication Engineering Sona College of Technology Salem, India. "Every speed breaker is now a source of power", 2010 International Conference on Biology, Environment and Chemistry IPCBEE vol.1 (2011) © (2011) IACSIT Press, Singapore.

[5] Electricity consumption from Tamil Nadu electricity board website

[6] Mohsen Partodezfoli, Abbas Rezaey, Zahra Baniasad & Horieh Rezaey, "A Novel Speed-Breaker for Electrical Energy Generation Suitable for Elimination of Remote Parts of Power Systems where is Near to Roads", Journal of Basic and Applied Scientific Research (www.textroad.com) ISSN 2090-4304 © 2012, TextRoad Publication.

[7] M.Sc. Johan Granlund, Swedish & Dr Anders Brandt Road Administration (2008). "Bus Drivers' Exposure to Mechanical Shocks Due to Speed Bumps". Society for Experimental Mechanics, IMAC XXVI Conference and Exposition on Structural Dynamics.

[8] Shubhra Priyadarshani, "Generating electricity from speed breakers", Guwahati (Assam) June 15, 2007.

[9] S. A. Jalihal, K. Ravinder, T.S. Reddy, "Traffic characteristics of India," proceedings of the Eastern Asia Society for Transportation Studies, Vol. 5, pp.1009 - 1024, 2005.

[10] Syed Khalid Rahman, Md.Saiful Islam, Jakeya sultana Jyoti, "Generation of Electricity Using Road Transport Pressure", International Journal of Engineering Science and Innovative Technology (IJESIT) Volume 2, Issue 3, May 2013.

[11] TRGI (2012) Transport Research Group of India.

[12] Website of Google.

[13] Website of Wikipedia.