

**INTERNATIONAL JOURNAL OF ENGINEERING SCIENCES & RESEARCH
TECHNOLOGY****REVIEW OF LITERATURE ON POWER GENERATION THROUGH SPEED
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ABSTRACT

The objective of this paper is to bring in notice source of energy which can generate the electricity and is non-conventional in nature. Electricity is the most essential form of the energy nowadays and cannot even think of life without it. Maximum percentage of power generation is done via conventional sources of energy which are getting depleted every other moment. Here comes the need to look for alternatives where we can generate the power via non-conventional sources and no pollution. One such way we found is generating power by air compression/friction on the road. Complete arrangement is placed under the speed breaker on the roads, and when vehicle passes over it, the spin the rollers connected to a generator which in response generates the power. This process may prove to be boon to power generation as numbers of vehicles are increasing every day.

KEYWORDS: energy conservation, non-conventional sources, power generator, rack and pinion, speed breaker**I. INTRODUCTION**

All content should be written in English and should be in 1 column. High percentage increase in consumption of energy adds to the need of discovering non-conventional resources of energy. The automotive industry in India is the fastest growing and one of the largest in the world with an annual production of 23.96 million vehicles in FY 2015–16[1]. This number could be the answer of generating power via non-conventional sources.

In this paper, we have discussed on the subject of power generation from speed breaker and the promising mechanism required for it. Speed Breaker Power Generation (SBPG) is one of the most recent and reliable power generation concepts for generating clean electricity from the millions of vehicles on our roadways. Once the system is completely optimized and installed we have anticipated that the technique may be used to replace conventional electrical supplies for powering roadway signs, street and building lights, storage systems for back-up and emergency power, and other electronics appliances, and even devices used in homes and businesses.

In this world where there is scarcity of electrical power supply, this project will be helpful to solve the power crisis to an extent. This project has a number of advantages such as; it is economical and easy to install, free from all types of pollutions and the maintenance cost is low. Speed breaker power generator system prototypes have been designed, built and experimentally tested. [2] The generator relies on the use of different gear combination to harness electricity from the speed breaker. This technique is quite promising due to its better efficiency and energy recovery criteria

II. LITERATURE REVIEW

Initially, electrical crisis in South Africa has made there people to implement this method to light up small villages of the highway. The thought is basic physics i.e. to convert the kinetic energy of the vehicles into electrical energy that gone wasted when the vehicle passes over speed-breaker. Since then, a lot has been done in this field. [3]

An amateur innovator in Guwahati has developed a simple mechanism that can generate power when a vehicle passes over a speed breaker. Kanak Gogoi, a small time business-man, has developed a system to generate power by converting the potential energy generated by a vehicle passing up on a speed breaker into kinetic energy. This innovation has caught the eyes of the Indian institute of technology (IIT), Guwahati, which will fund a pilot project to produce electricity from speed breaker. [3]

Electric vehicle charging station at a McDonald's in Cary, N.C., a Burger King franchise in New Jersey said it would be testing speed bumps with the intention of harnessing kinetic energy in the locations busy drive-thru lane. [4] If the kinetic energy generated by moving vehicles was captured by New Energy Technology's Motion Power speed bumps twice per day, then it could generate enough electricity to power over half a million homes each day, according to company officials. "More than 150,000 cars drive through our Hillside store alone each year, and I think it would be huge to capture the wasted kinetic energy of these hundreds of thousands of cars to produce clean electricity," said Andrew Paterno. Paterno and his business partner, Michael Wallstein hold and operate twelve Burger Kings in the New York Metro area. [4]

A survey has been conducted about electricity consumption from Tamil Nadu electricity board website. It says that: The amount of electricity consumed in a single night by all the street lights around Chennai city is equal to consumption of electricity in a remote village for almost 45 days. Similar surveys inspired us a lot and made us to think about saving this wasted energy which made us introduce this new technique. [5]

This paper attempts to demonstrate how energy can be tapped and used at a commonly used system- the road speed breakers. The number of vehicles passing over the speed breaker in roads is increasing every passing day. A large amount of energy is wasted at the speed breakers via dissipation of heat and also through friction, every time a vehicle passes over it. There is great opportunity 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 street lamps, near the speed breakers. The utilization of energy is an indication of the growth of a nation, as it will save the energy generated at power station which is using non-renewal sources of energy. For instance, the per capita energy consumption in USA is 9000 KWh (Kilo Watt hour) per year, whereas the consumption in India is 1200 KWh (Kilo Watt hour). One might conclude that to be materially rich and prosperous, a human need to consume more and more energy. A recent survey on the electricity consumption in India had published a sad report that approx. 85,000 villages in India do not still have electricity. Supply of power in most part of the country is poor. Hence more research and development and commercialization of the newly discovered technologies are needed in this field. India, unlike the top developed countries has very poor roads. Talking about a picky road itself includes a number of speed breakers. By just placing a unit like the "Power Generation Unit from Speed Breakers", so much of energy can be generated. This energy can be used for the lights on the either sides of the roads and thus much power that is consumed by these lights can be utilized to send electricity to these villages. [6]

The rotor is directly connected to the prime mover and rotates as the prime mover turns. The rotor contains a magnet that, when turned, produces a rotating magnetic field. The rotor is surrounded by a stationary casing called the stator, which encloses the wound copper coils or windings. When the moving magnetic field passes across these windings, electricity is generated in them. By controlling the speed at which the rotor is turned, a steady flow of electricity is generated in the windings. These windings are connected to the electricity network through transmission lines. IIT Guwahati has appraised the machine and recommended it to the Assam ministry of power for large scale funding. A K Das, a professor at IIT's design department says it is a 'very practical proposition' to harness thousands of MWs of electricity available across the country every day. A vehicle weighing 1,000 kg passing up a height of 10 cm on such a rumble strip produces approximately 0.98 kilowatt power. So one such speed-breaker on a busy highway, where about 100 vehicles passing every minute, approx. one kilo watt of electricity can be generated every single minute. The figure will be giant at the end of the day. A storage module like an inverter will have to be fitted to each such rumble strip to store this generated electricity. The cost of electricity generation and storage per megawatt from speed-breakers will be around Rs 1 crore as opposed to about Rs 8 crores in thermal or hydro power stations. [6]

Recently numerous attempts and models have been suggested and tested for harnessing kinetic energy of vehicles through speed breaker. 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 also 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. [7]

Novel Speed-Breaker for Electrical Energy Generation Suitable for Elimination of Remote Parts of Power Systems where is Near to Roads. Mohsen Partodezfoli1, Abbas Rezaey, Zahra Baniasad, HoriehRezaey Department of Electrical and Computer Engineering, Islamic Azad University, South Tehran Branch, Tehran, Iran. This device converts the kinetic energy of the vehicles into electrical energy. This is done by moving plate

installed on the road, this plate take the stroke motion of the vehicles and convert it to the rotary motion by crank mechanism and it generates the electricity. [8]

III. TYPES OF MECHANISM

There are different types of mechanism used by different authors for generating electricity through speed breaker. [9]

1. Roller Mechanism:



Fig 1. Roller Mechanism [9]

In this set up, an iron roller is preset on a wooden ramp on which vehicle passes due to which roller rotates in the direction of the vehicles passing over it. The roller is linked with the shaft of DC motor (used as a generator) via a chain and sprocket arrangement. Now as vehicle passes over it; the roller rotates the shaft of the DC motor and as a result produces electricity. Hence DC power is produced via roller mechanism which can be stored in the battery and used for future use. The advantage of this mechanism is that electricity can be relatively produced in a simple manner without any pollution. But strength and losses are the restrictions of this method which is to be taken in consideration.

2. Rack and Pinion Mechanism:

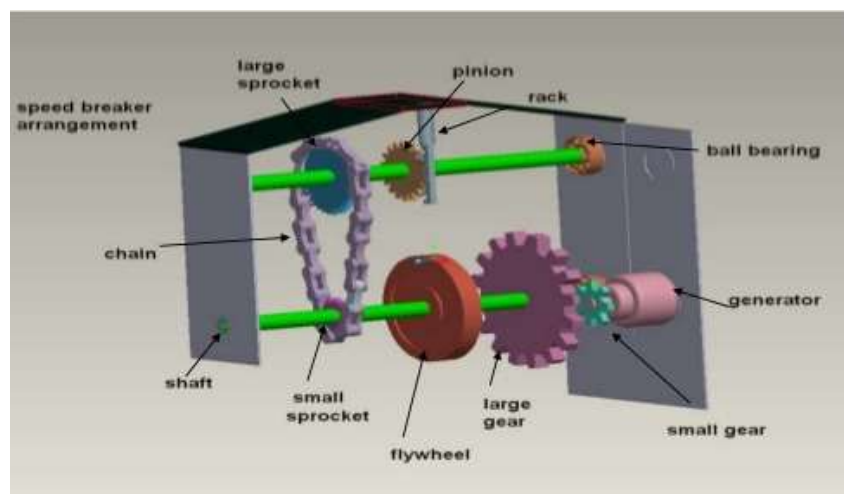


Fig 2. Basic Rack and Pinion Mechanism [10]

After roller mechanism, there was a major improvement in speed breaker generating system unit. The improvement was using rack and pinion mechanism where the reciprocating motion of the speed-breaker is converted into rotary motion. Here, the top part of the rack is connected to the speed breaker and the lower part is linked with pinion. As the vehicle passes over the speed breaker the rack moves in the downward direction

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which in response rotates the pinion in clockwise direction. The axis of the pinion is attached with the sprocket arrangement on the shafts.[11] The sprocket arrangement is made of two sprockets, one larger and other smaller. Both the sprockets are connected via 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 one, the speed that is available at the larger one is relatively multiplied at the rotation of the smaller sprocket. As the smaller sprocket rotates the shaft rotates which in turn rotates the shaft of DC motor via gear assembly. Also a flywheel is connected on the shaft of the smaller sprocket to get unbroken rotation of the shaft and thus the generator. Hence, electricity is produced when pinion is rotates in clockwise direction but what when the rack moves in upward direction. Therefore when the pinion will rotate in anticlockwise direction and cancel the movement of clockwise direction, the efficiency of the overall system decreases.

3. Air Piston Mechanism:

Different approaches were made to generate power through speed breakers but in some way or other every approach had its own limits. Air piston mechanism is a different kind of approach with high efficiency as compared to previous ones. In this, when the vehicle passes over the curved shape metal sheet i.e. dome, it goes down due to the load of vehicle.



Fig 3. Air Piston Mechanism [12]

This assembly pushes down to the spring. This curved dome is connected with the piston via linking rod. This quick movement of piston downward compresses air in the compressor cylinder which escapes out from the delivery valve and it stored in the air cylinder. When the vehicle goes away from the speed breaker, the dome along with piston moves up quickly due to which the action of spring allows air intake into the compressor cylinder. These steps are repeated with the consecutive passing of vehicles. The frequent up and down movement of air compressor piston which is attached with speed breaker dome completes the intake and exhaust strokes of the air compressor repetitively thus rotating the shaft of the generator. Therefore, these repeated cycles will be possible with busy roads will store a good amount of pressurized air in the air cylinder that can be

utilized for useful purposes. Hence power is generated with maximum efficiency. But this set up is not favorable from economical point of view.

Comparison of different speed breaker mechanism

Sr.No	Parameters	Roller Mechanism	Rack and Pinion Mechanism	Air Piston Mechanism
1.	Cost	Cheap	Moderate	Costly
2.	Mechanism Setup	Very Easy	Difficult	Very Difficult
3.	Maintenance	Less Required	Weekly Basis	Daily Basis
4.	Efficiency	~50%	~70%	~85%
5.	Design	Easy to design	Depends upon weight sustaining capacity	Depends upon compressing power of air pistons

IV. CONCLUSION

Electricity plays a very important role in our life. Due to enormous increase in population, the present power generation techniques/processes have become inadequate to accomplish our requirements. In this project we discover technology to produce electricity from speed breakers, where the system produced is trustworthy and will help in conserving our natural resources. If in near future we use this technique, this will prove a huge bonus to the world, as the generated power can be used for illuminating Street Lights, Road Signals, Sign boards on the roads, Lighting of the bus stops, Lighting of the check post on the highways etc. As the conventional sources are depleting quickly, it's high time to consider alternative resources. So this system not only endows with alternative but also adds to the better economy of the country.

V. FUTURE SCOPE

This mechanism to generate electricity is still in the stage of development. In future it can be used to generate the power throughout the year. Power generation by this mechanism is not affected by any environmental conditions. It is pollution free mechanism for generation of electricity. It is suitable to implement at parking of multiplexes, malls, toll booths, signals, etc. The energy generated can be used to charge batteries and to light up the streets, etc. Such speed breakers can be designed for heavy vehicles, thus increasing input torque and eventually output of the generator.

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