

International Journal of Innovative Research in Science, Engineering and Technology

(A High Impact Factor, Monthly, Peer Reviewed Journal)

Visit: www.ijirset.com

Vol. 8, Issue 3, March 2019

Study on Generation of Electricity using Speed Breakers of Different Mechanisms

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ABSTRACT: Electricity has been considered as an important component in today's world. It has been basic part of nature and is widely used form across the globe. Considering rapid growth of population day by day and conventional energy sources are lessening. These fossil fuels make a lot of pollution which impact on environment. It has become mandatory to obtain energy from a source which is clean, environment friendly and sustainable. Major cities in India have large volume of traffic. Considering it as merit a system is developed to obtain energy from speed breakers which has proven beneficial for cities. The number of vehicle running on the roads are increasing daily. There is tremendous amount of energy (mass) which acts on roads depending on that various types of mechanism have been developed on speed breakers through which electricity is generated. The above paper illustrates on study of mechanisms for generation of electricity from speed breakers which is way more pollution free, cheapest and form a renewable sources of energy. The main objective behind the paper to show the detailed survey of how speed breakers can be now used as a source of power.

KEYWORDS: Rack and pinion mechanism, Air compressor mechanism, Roller mechanism.

I. INTRODUCTION

According to survey conducted by MINISTRY ROAD AND HIGHWAYS, GOVERNMENT OF INDIA increase in usage of vehicles since 2010 was 127 million and 2016 it was increased by 230 million were playing on Indian roads. The rate of growth increased by 10 percent. The increase in traffic and number of speed breakers on roads motivate to innovate a device which can channelize the energy of vehicles that is wasted on speed breakers to some useful work. Today energy has been one of an important aspect. It is seen that it proves to be very costly for generation energy through conventional means which also makes a lot of pollution. In order to minimize the emission of greenhouse gases, renewable energy technologies are widely used for electricity generation.

In today's scenario road networks around the world are increasing rapidly on larger rate. Number of speed breakers constructed on these road networks are of prime importance. These speed bumps are basically provided to reduce speed of vehicles but moving with technology, innovation and growth of transportation these bumps are utilized for generating energy. It works on basic principle "The kinetic energy of the moving vehicles can be converted into mechanical energy and then further into electrical energy. Rack and pinion mechanism which works on electromechanical principle, Air compression system in which air from atmosphere is made to store in a cylinder through piston assembly. Force is exerted by vehicles passing through speed breakers and these speed breakers are connected to pistons which make an impact. Compressed air can be utilized for various purposes.

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II. LITERATURE AND REVIEW.

‘SPEED BREAKER POWER GENERATOR’ by Ali Azama, M. AqeelAslamb, Shoukat Alia, F.Q. Yousef-Zaib (2016)

Rack and Pinion Mechanism

In this mechanism, when a car reaches the speed-breaker, weight is applied on the speed-breaker. In this mechanism, a rack IS connected to the speed-breaker and there is two pinion mesh across the rack. As weight is applied on the speed-breaker, there is downward movement in the rack creating linear motion. The pinions rotate as they are connected on both sides of the rack. At this very particular moment, linear motion converts into angular motion. The pinion on the right side transfers the power whereas pinion on the right keeps on moving without any transfer of power. The pinions are designed in such a way that when load is applied, one side of pinion and another disengages. Likewise, restoring forces engages another side of the pinion and first side of pinion disengages. Thus transfer of power is in forward as well as reverse stroke of the speed breaker respectively providing constant angular motion.

The no. of revolutions can be increased by using different teeth and diameter of gear. With the help of a belt, mechanical rotation is used to rotate the generator’s shaft. The shaft which has maximum RPM is coupled with DC Generator. The DC generator produces direct current. The mechanism is based on Faradays law of induction which states that when coil moves inside the magnetic field, it generates electric current. It rotates the rotar of generator, and in this way electricity is produced.

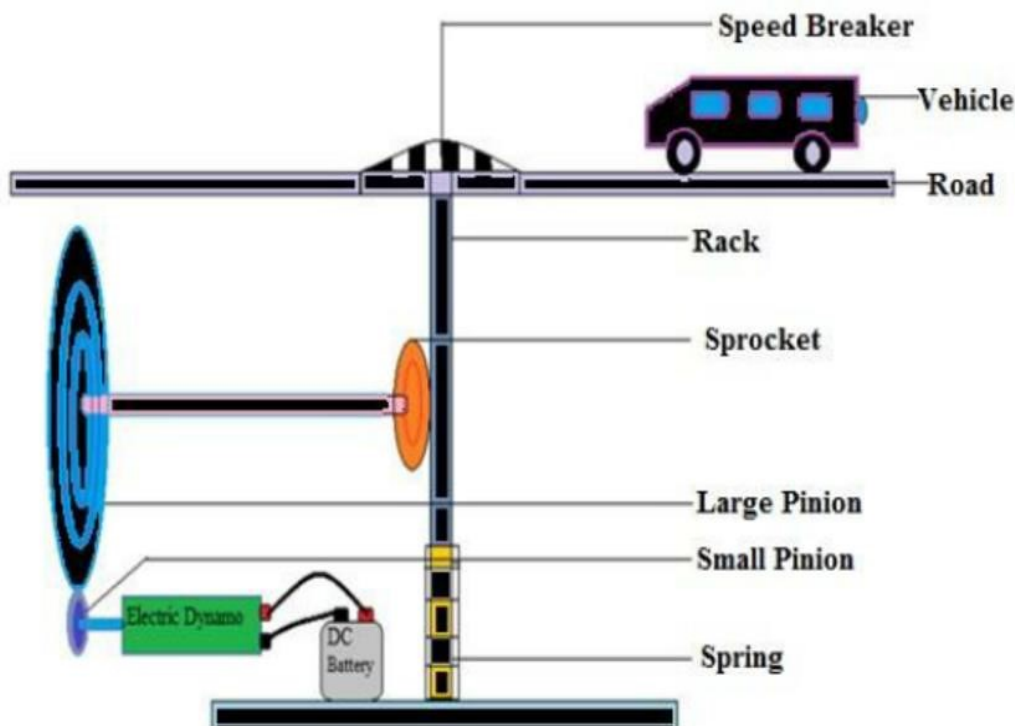


Fig no : 1 Rack and Pinion Mechanism

(a) Force applied by vehicle on speed breaker. (b) Transfer of force through rack (c) Sprocket and pinion connection through rotating shaft (d) Transfer of power from large to small pinion (e) Electric Dynamo (f) DC battery.

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‘Development Of Speed Breaker Device For Generation Of Compressed Air On Highways In Remote Areas’ by Ashok Kumar Sharma¹, Omkar Trivedi², Umesh Amberiy³, Vikas Sharma⁴

Compressed Air Mechanism

Today use of compressed air is widely done in many mechanical, automobile, electrical companies. It proves to be very costly for its production. The basic principle of air compressor is a machine which uses a drive motor or an electric gas to power the device, which sucks in successive volumes of air from the atmosphere, compresses (squeezes) each volume of air in the limited space to increase the pressure, resulting in a smaller amount, and then transfers the air high pressure to cylinder.

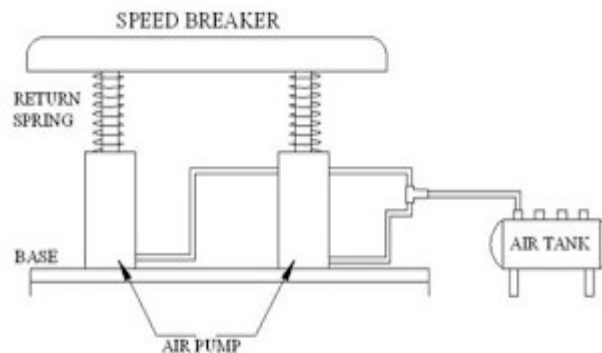


Fig no: 2 Compressed Air Mechanism

(a) Speed breaker (b) Piston cylinder attached with return spring (c) Air pump (d) Storage of compressed air in Air tank

In this paper illustration is done on production of compressed air by using potential energy and kinetic energy (motion) of car is used to apply a force on speed breaker. As the car passes through speed breaker it suspends its position in downward direction. There is a link between speed breaker and piston cylinder by connecting shaft. This makes connecting shaft to push the piston downwards compresses air in the compressor cylinder which escapes out (exhaust stroke) from the delivery valve and stored in the air cylinder (tank). Air from atmosphere is trapped and compressed through pistons. During this mechanism there is a need of repulsive force to get speed breaker on its original position so springs were fitted to its panels. This made piston to lift itself in upward direction. These steps are repeated with the successive passing of vehicles. The frequent up and down movement of air compressor piston (attached with speed breaker dome) complete the intake and exhaust strokes of the air compressor repeatedly. These repeated cycles will be possible with busy roads will store a good amount of pressurized air in the air cylinder that can be further utilized for useful purposes.

The paper concludes this mechanism has proven to be very useful in utilization of energy of vehicles lost on speed breakers. The manufacturing steps of this device are very simple and very specific manufacturing facilities are not needed. On an average movement of vehicles over it generates enough air (80 cc of atmospheric air is pushed up into the air tank connected with the device, per cycle of suction and exhaust strokes) for commercial utilization.

‘Design of Power Generation Unit Using Roller Mechanism’ by B. Santosh Sarma¹, V. Jyoti², D. Sudhir³
Roller Mechanism

The paper is about the design of power generation unit using roller mechanism. In short it is about the low rate of consumption of power for a particular work. If vehicles pass over the roller mechanism set up electricity can be produced. It is the clear idea about to fit rollers in speed breakers from which on passing the vehicles it can generate the power required. For reduction of carbon dioxide emission, renewable energies are considered as proper alternative energy. The main advantage is that they produce energy free of charge.

The basic principle of this system is simply conversion of mechanical energy into electrical energy. The system is made up of roller which rotates due to pressure exerted by vehicle passing over it. The wasted kinetic energy of vehicle is

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converted into electrical energy by roller mechanism through several energy conversion methods. The generated electricity is stored in battery and then use as per requirement.

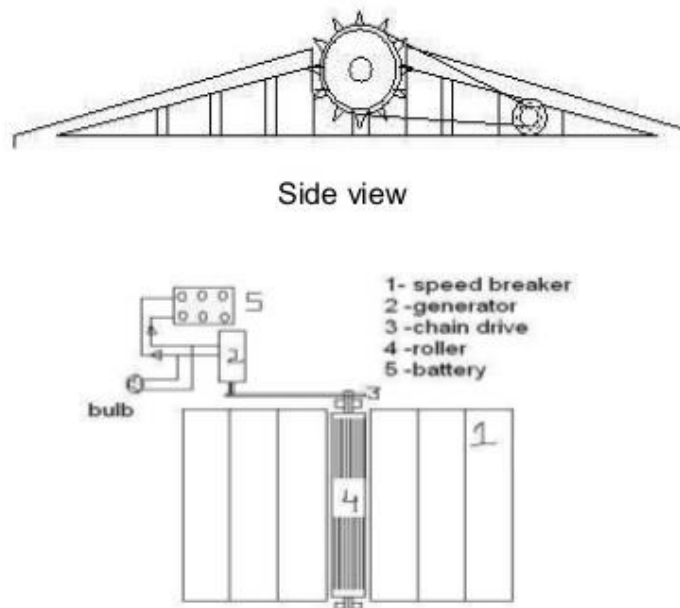


Fig no: 3 Roller Mechanism

(a)Speed breaker (b) Generator (c) Chain derive (d) Roller (e) Battery

In this project we replaced the streets with the specially designed rollers which directly absorb the kinetic energy of the moving vehicles and converts them to rotational energy and thereby rotating the generator, to produce the electrical power. In this mechanism, a roller is fitted in between a speed breaker and some kind of grip is provided on the streets so that when a vehicle passes over streets it rotates the roller. As the shaft of D.C. generator rotates, it produces electricity. This electricity can be stored in a battery. We can use this stored electricity as per our requirement. Output of the battery is used to lighten the street lamps on the road. Now during day time 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. The electric generator is a device that converts mechanical energy into electrical energy, generally using electromagnetic induction. This mechanism generation of electricity is possible using road track.

The growth of the nation is indicated by the utilisation of energy in that country. We need electricity for every small thing. So, this research is a small step to fulfil the requirement of increasing electricity demand and contributes something for the society. The project introduce a generation system of energy from streets. It produces electrical energy proportional to traffic density which shows more possibility of collecting large amount of energy in busy cities. By adopting this arrangement, the load on present electrical sources can be minimised to some extent. ‘

‘Electrical Power Generation Using Railway Track’ by Narendra Ku. Sahu¹, Hemant Ku. Sahu², Praveen Dalai³, Praveen Sinha⁴, Abhijit Banerjee⁵, Lavleen Dhalla⁶

Power generation by Railway Tracks.

A combination of rapidly increasing world population and an increasing energy-intensive lifestyle has led to doubts about the sufficiency of natural resources. Today technological innovation is often called upon to deliver solutions to

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the sustainable development challenges that the world faces. The energy obtain from railway track is one source of to generate non-conventional energy because there is no need of fuel as a input to generate the output in the form electrical power and these is done by using simple gear drive mechanism. Ground vibrations are generated by the trains a system for extracting energy from the passing wheels of a railway and converting that energy into rotational motion of the shaft and further converting the rotation of shaft into electrical energy and saving excess energy if any is been studied.

When a train moves over the track the track get deflected vertically due to the load from the moving bogies. The vertical displacement of the track under the weight of a passing bogies can be connected to devices (Vibration energy converter) to generate electricity & to provide power to the nearby equipment (signal lights, railway crossings gates) and can also be stored into the battery for future use.

III. CONCLUSION

In coming days demand of electricity will be very high and production costly. Speed breaker power generator will prove a great boom to world in future. The aim of paper was to analyse various mechanisms for green power generation in order to contribute toward developing the world by enriching it with utilization of available resources in more useful manner.

Now the time has come for using these types of innovative ideas and it should be brought into practice. After referring to many paper we found rack and pinion mechanism more efficient and cost effective for generating energy through speed breakers.

IV. ACKNOWLEDGEMENT

With the immense pleasure, I am presenting this paper as a part of my curriculum. I wish to thank all the people who gave me an unending support right from stage when idea was conceived. I take this opportunity to thanks our Prof. Savita Jangale for her continual support and encouragement that made paper valuable. I express my profound thanks to Yash Agarwal, Ganesh Jadhav, TejaswiniSuryawanshi for their kind help and assistance. Last but not least I would thank beloved parents, friends and well-wishers for their kind support and encouragement.

REFERENCES

- [1] Hasan Qureshi, Amir Shaikh, Fareed Mansuri, Prajyot Wade 'ENERGY GENERATION FROM SPEED BREAKER' *International Journal of Research in Advent Technology (IJRAT)*, Vol.4, No.3, March 2016
- [2] Noor Fatima, Jiyaul Mustafa, Shoukat Alia, F.Q. Yousef-Zaib 'PRODUCTION OF ELECTRICITY BY THE METHOD OF ROAD POWER GENERATION' *International Journal of Advances in Electrical and Electronics Engineering (IJAEED)*, Volume1, Number 1.
- [3] Narendra Ku. Sahu, Hemant Ku. Sahu, Praveen Dalai, Praveen Sinha, Abhijit Banerjee, Lavleen Dhalla
- [4] 'ELECTRICAL POWER GENERATION USING RAILWAY' *International Journal of Scientific Research in Computer Science, Engineering and Information Technology (IJSRCSEIT)*, Volume 2, Issue 3 (2017)
- [5] Ali Azama, M. Aqeel Aslamb, Shoukat Alia, F.Q. Yousef-Zaib 'SPEED BREAKER POWER GENERATOR' *4th International Conference on Energy, Environment and Sustainable Development (ICEESD)* 2016.
- [6] B. Santosh Sarma, V. Jyothi, D. Sudhir 'DESIGN OF POWER GENERATION UNIT USING ROLLER MECHANISM' *IOSR Journal of Electrical and Electronics Engineering (IOSR-JEEE)*, Volume 9, Issue 3 Ver.1 (May – Jun. 2014), PP 55-60.
- [7] Mitul Patel, Prof. P. J. Gundaliya 'A STUDY ON SPEED BREAKERS' *International Journal of Advance Engineering and Research Development (IJAEERD)* Volume 4, Issue 3, March -2017 March 2017
- [8] Pankaj D. Jagtap, Sanket D. Pardeshi 'A REVIEW: COMPARISON OF DIFFERENT MECHANISMS FOR ELECTRICITY GENERATION USING SPEED BREAKER' *Multidisciplinary Journal of Research in Engineering and Technology (MJRET)*, Volume 1, Issue 2, Pg.202- 206.
- [9] Mrs. S.S Pitre , Mr. Rahul Raj , Mr. Sachin Raina , Mr. Akash Bhoria , Mr. Alok Kumar 'ELECTRICITY GENERATION USING SPEED BREAKER' *International Research Journal of Engineering and Technology (IRJET)* Volume: 05 Issue: 03, Mar-2018
- [10] Niyazi Tanlak, Fazil O. Sonmez, Mahmut Senaltun 'SHAPE OPTIMIZATION OF BUMPER BEAMS UNDER HIGH-VELOCITY IMPACT LOADS' *Journal of Engineering Structures (JES)* Volume 95 Pages 1-170 (15 July 2015)
- [11] Ashok Kumar Sharma, Omkar Trivedi, Umesh Amberiya, Vikas Sharma 'DEVELOPMENT OF SPEED BREAKER DEVICE FOR GENERATION OF COMPRESSED AIR ON HIGHWAYS IN REMOTE AREAS' *International Journal of Recent Research and Review (IJRRR)* Vol. 1, March 2012



ISSN(Online): 2319-8753
ISSN (Print): 2347-6710

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Visit: www.ijirset.com

Vol. 8, Issue 3, March 2019

- [12] M.M. Davoodi, S.M. Sapuan, R. Yunus'CONCEPTUAL DESIGN OF A POLYMER COMPOSITE AUTOMOTIVE BUMPER ENERGY ABSORBER'*Journal of Materials and Design(JMD)*Volume 29, Issue 7 Pages 1285-1496 (2008)
- [13] Javad Marzbanrad, Masoud Alijanpour, Mahdi Saeid Kiasat'DESIGN AND ANALYSIS OF AN AUTOMOTIVE BUMPER BEAM IN LOW-SPEED FRONTAL CRASHES'*Journal of Thin-Walled Structure (JTWS)*.Volume 47, Issues 8-9.