Power Generation By Using Speed Breakers

Shubham Pawar1, Dattatray Pawar2, Sanket masal3, and Prof.Pradip Vyavahare4

1,2,3UG students Electrical department, Sinhgad College of Engineering, Pandharpur.

4Associate Prof. Electrical Engineering department SKN Sinhgad College of Engineering, Pandharpur .

shubhampawar.sknscoe.elec@gmail.com1, dattatraypawar.sknscoe.elec@gmail.com2, sanketmasal.sknscoe.elect@gmail.com3

& pradip.vyavahare@sknscoe.ac.in4

ABSTRACT

Electricity is generated by replacing the usual speed breakers with some simple mechanism. As vehicles pass over the speed breakers, rack and pinion mechanism works and with the help of high tension springs in turn generate electricity. This method is an effective way to produce electricity as the number of vehicles is ever increasing. It can be effectively placed near toll plazas, parking lots and other locations where density of vehicles is very high. A rack and pinion, spring assembly mechanism is provided which transfer the motion to a DC motor/generator for electricity generation. This method provides a cost effective way to generate electricity from the mechanical energy of dynamic vehicles on roads. A large amount of energy is wasted by the vehicles on the speed breakers through friction, every time it passes over it. Energy can be produced by using the vehicle weight and speed. So here we propose a smart speed breaker that generates power. The reciprocating motion of the speed breaker is converted into rotary motion using the rack and pinion arrangement. We design a smart speed breaker that can pass vehicles coming from both sides and yet generate energy from it. The system makes use of mechanical assembly with metal sheets with linkages that press down with spring arrangement. The system makes use of the speed breaker press and then uses a rack and pinion arrangement to press down and run generator motor thus generating energy. The spring mechanism is the used to drive the

speed breaker back into original position. It converts rotary motion into linear motion, but sometimes we use them to change linear motion into rotary motion. This mechanism is very economical and easy to install. By doing proper arrangements we may generate high power electricity from road tr.

INTRODUCTION

In the present day power becomes the major need for human life .The availability and its per capita consumptions are regarded as the index of national

standard of living in the present day civilization. Energy is an important input in all the sectors of any countries economy. Energy crisis is due to two reasons, firstly the population of the world has been increased rapidly and secondly standard of living of human beings has increased. India is the country, which majorly suffers with lack of sufficient power generation. The availability of regular conventional fossil fuels will be the main sources for power generation, but there is a fear that they will get exhausted eventually by the next few

decades. Therefore, we have to investigate some approximate, alternative, new sources for the power generation, which is not depleted by the very few years. Another major problem, which is becoming the exiting topic for today is the pollution. It suffers all the living organisms of all kinds as on the land, in aqua and in air. Power stations and automobiles are the major pollution producing places. Therefore, we have to investigate other types of renewable sources, which produce electricity without using any commercial fossil fuels, which is not producing any harmful products. There are already is exist such systems using renewable energy such as solar wind, OTEC (ocean thermal energy conversions) etc…for power generation. The latest technology which is used to generate the power by such renewable energy" POWER HUMP".

Use of Only Speed Breakers instead of Rough or Plane Roads:

Now the question arises as to why only the speed breaker is used and not the rough or plane roads where the kinetic energy of the vehicle is more than that obtained on the speed breaker. The answer to this question is obvious; consider for example: A car or any heavy vehicle moving with a speed of 100 mph on the road and passing over this speed breaker which is fitted at the level of the road then the spring will gain the speed of nearly 90 mph (due to losses) of speed breaker. That is the main reason for using this concept on the speed breaker. The rough or plane road will not provide the torque necessary for energy generation.

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 every single minute. This type of energy is a non-conventional resource or renewable 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. It is a mechanical type of arrangement. 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. The design of speed breakers was developed long ago but only utilized by few nations, as there were limitations of speed breaker power generators.

LITERATURE SURVEY

Mishra, A., and Kale, P., (2013) the energy crisis led to the idea of generating power using speed breaker. First to make use were South African people.

Prabhu, G.R., and Ethiraj, G., (2013) their electrical crisis has made them to implement this method to light up small villages of the highway. The idea of basic physics to convert the kinetic energy into electrical energy that goes waste when the vehicle runs over the speed-break was used. Since then a lot has been done in this field. The idea caught our working team and we have decided to develop such a project that will produce more power and store it for use at night time as it proves to be a boon to the economy of the country. The Burger King on U.S. Highway, Customers pull in and out all day, and at least 100,000 cars visit the drive-thru each year.

Gupta, R., Sharma, S., and Gaykawad, S., (2013) a newly installed, mechanized speed bump will both help them slow down and harvest some of that coasting energy. The weight of a car is used to throw a lever, explains Gerard Lynch, the engineer behind the Motion Power system developed for New Energy Technologies, a Maryland-based company.

Fawad, A.S., (2015) the instantaneous power is 2,000 watts at five miles-per-hour, but its instantaneous which means some form of storage will be required. IIT Guwahati has evaluated the machine and recommended it to the Assam ministry of power for large scale funding. IIT design department says it is a „very viable proposition" to harness thousands of mega watts of electricity untapped across the country every day.

Gorle, A.L., Patil, A.N., Thawale, A.V., Giri, S.V., Darjee, B., and Patil, L.H., (2018) one such survey was done by the Tamil Nadu electricity board. According to this survey, the electricity consumed by a remote village for 45 days is equal to the electricity consumed by all the street lights in one night in Chennai city. By this scenario, we can get an idea of the rate by which electricity is being consumed in India, also, this consumption rate is increasing day by day. Electricity and power can be called as the backbone for development and modernization of the country and therefore, the rapid speed of development has lead to a constant increase in the rate of electricity consumption. The figures also show a rapid increase in the electricity consumption in India from the year 2014 to 2017, the electricity consumption per capita of India in the year 2014 was 805.60kwh, whereas it was 1149kwh in the year 2017. Taking into consideration this situation, it is mandatory that either consumption of electricity must be reduced or the generation of electricity must be increased. The consumption of electricity can be reduced only to a certain limit, beyond this limit the development can be hampered.

PROPOSED METHODOLOGY

Electricity can be generated with the help of speed breaker by making gear arrangement and using electronic gadgets, thus a huge amount of electricity can be generated saving lot of money. We can develop electricity from speed breakers by using 3 Mechanisms basically they are as follows:

Rack & pinion mechanism

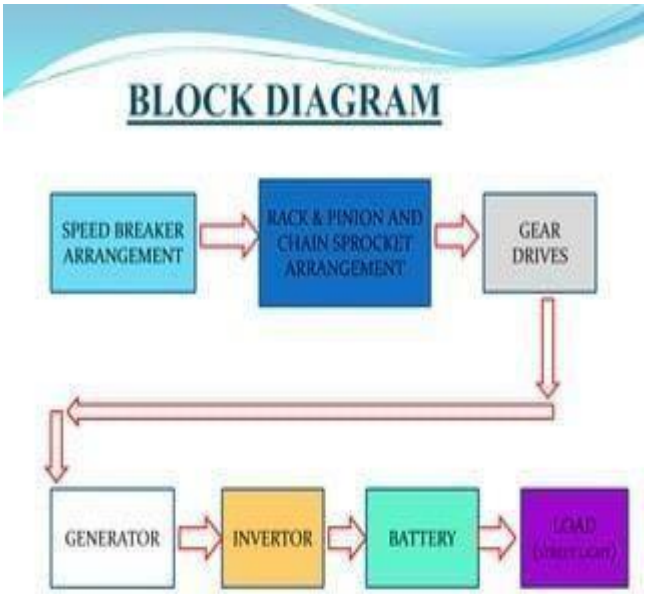
Spring mechanism

Chain sprocket mechanism

Since Rack-pinion mechanism is convenient to produce ample amount of energy with maximum efficiency. We have chosen this method for our project

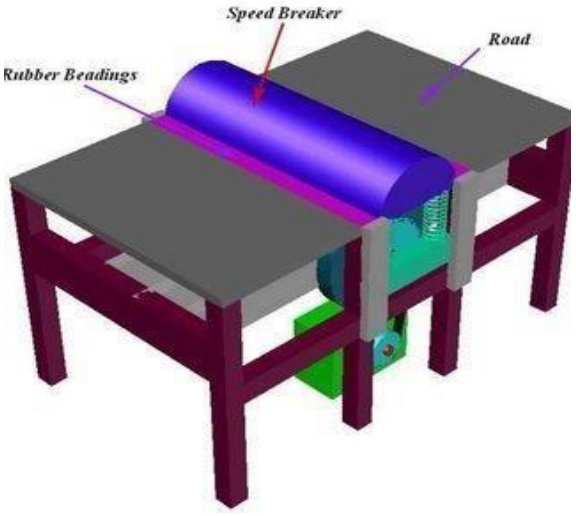
with a very simple and effective design for generating electricity using a generator. The project is concerned with generation of electricity from speed breakers-like set up. The load acted upon the speed breaker setup is there by transmitted to rack and pinion arrangements. Here the reciprocating motion of the speedbreaker is converted into rotary motion using the rack and pinion arrangement. The axis of the pinion is coupled with a gear. This gear is meshed a pinion. As the power is transmitted from the gear to the pinion, the speed that is available at the gear is relatively multiplied at the rotation of the pinion which is coupled to gear arrangement. Here we have two gears with different diameters. The gear (larger dimension) is coupled to the axis of the pinion. Hence the speed that has been multiplied at the smaller sprocket wheel is passed on to this gear of larger dimension. The pinion is meshed to the gear. So as the gear rotates at the multiplied speed of the pinion, the pinion following the gear still multiplies the speed to more intensity. Hence, although the speed due to the rotary motion achieved at the first gear is less, as the power is transmitted to gears the speed is multiplied to a higher speed. This speed is sufficient to rotate the rotor of a generator. The rotor which rotates within a static magnetic stator cuts the magnetic flux surrounding it, thus producing the electric motive force (EMF). This generated EMF is then sent to a bridge rectifier, where the generated AC current is converted to DC. This regulated EMF is now sent to the lead-acid battery.

BLOCK DIAGRAM



Rack and pinion mechanisms:-

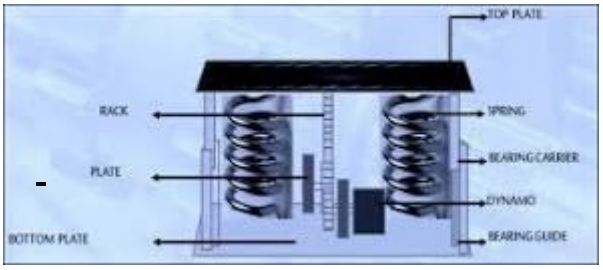
The reciprocating motion of the speed-breaker is converted into rotary motion using the rack and pinion arrangement.



SAMPLE MODULE PHOTO:

Spring mechanisms:-

In case the vehicle passes over the system then spring will be compressed and the kinetic energy of the vehicle convert into potential energy, which is stored in the spring .



CALCULATIONS & RESULTS

Let consider,

The mass of a vehicle = 500 Kg (Approximately)

Height of speed brake

= 10 cm

Work done = Force * Distance Force = Weight of the Body

=500 Kg x 9.81

=4905N

Distance travelled by body = Height of speed brake

= 10 cm Output power = Work done/Sec

= (4905 x 0.1)/60 = 8.175 W

Power developed for 1 vehicle passing over the speed breaker

arrangement for one minute is 8.175W.

Power developed for 60 minutes (1 hour) = 8.175 x60 = 490.5W

Power developed for 24 hours = 490.5 x 24 = 11.772 KW

CONCLUSION & FUTURE SCOPE

It is a non conventional type of producing the energy. The existing source of energy such as coal, oil etc may not be adequate to meet the ever increasing energy demands. These conventional sources of energy are also depleting and may be exhausted at the end of the century or beginning of the next century. Consequently sincere and untiring efforts shall have to be made by engineers in exploring the possibilities of harnessing energy from several non- conventional energy sources. This project is a one step to path of that way. The overall goal was to design the speed breaker System while keeping the engineering, producer and customer models in check. The reason why this feature was used more than all of the other features are because the other features would not have as much effect on the complete system. By changing the size and desirable price, weight and capacity can be realized. We used a survey to find out how the price, weight and capacity were scaled. Much was learned on how to and not to conduct a survey.

ADVANTAGES

Pollution free power generation.

Simple construction, mature technology, and easy maintenance.

No manual work necessary during generation.

Energy available all year round.

No fuel transportation problem.

No consumption of any fossil fuel which is non-renewable source of energy.

Uninterrupted power generation during day and night.

Maximum utilization of energy.

Load to the piston cylinder arrangement is freely got by movement of vehicles.

No fuel storage is required.

REFERENCES

[1]. Alam A. Md. (2012) Renewable energy for sustainable Bangladesh (part-1). Energy and Environment.

[2]. Ahuja D. & Tatsutani M. (2009) Sustainable Energy For Developing Countries. S.A.P.I.EN.S. 8.1(8): No.1.

[3]. Das C. K. & Hossain S.M. (2013) Introducing speed breaker as a power generation unit for minor needs. 2nd International Conference on Informatics, Electronics & Vision (ICIEV- 2013). Dhaka University, Bangladesh. (73): No.1.

[4]. Dave J.J. (2010) Fairley's- Speed bumps ahead for electric-vehicle charging by, Spectrum, IEEE Journals & Magazines. 2(3): 75-79.

[5]. Fawad A.S. (2015) Air Compression and Electricity Generation by Using Speed Breaker with Rack And Pinion Mechanism. International Of Modern Engineering Research (IJMER). 1(5): 135-138.

[6]. Gorle A.L. ,Patil A.N. ,Thawale A.V. ,Giri S.V. ,Darjee B. & Patil L.H. (2018) "Literature Review on Electricity Generation using Speed Breaker". International Journal of Advanced Research in Computer and Communication Engineering. 10(7): 44-47.

[7]. Gupta, R., Sharma, S. & Gaykawad, S. (2013) A Revolutionary Technique of Power Generation Through Speed Breaker Power Generators. International Journal of Engineering Research & Technology (IJERT). 8(2): 1879-1883.

[8]. Mishra A. & Kale P. (2013) International Journal of Engineering and Science. (2).

[9]. Prabhu G.R. & Ethiraj G. (2013) International Journal of Advanced Research in Electrical. Electronics & Instrumental engineering. Innovation in Engineering

and Technology (IJIET). 2(2). First A. Author, Second B. Author, Jr., and Third C. Author, Member, IEEE

[10]. Yadav, V.K., Prajapati, S., Durgesh, porwal, A. (2019) Electric Power Generation through Speed Breakers. Innovation in Enginee