A Review: Regeneration of Energy from Speed Breaker

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Abstract

Nowadays energy has become one of the most vital things that we need so in this project we are constructing a unit which is capable of producing electrical energy using kinetic energy of vehicle passing over the speed breaker using a rack and pinion arrangement beneath it. As there are crises going on in the country we can use this setup where traffic intensity is very high like toll plaza of national and state highways etc. The energy accumulate in batteries and then transmitted to the street near the toll plaza etc. This unit necessity a vehicle moved over the speed breaker. As the vehicle departure, it presses the rack and it moves downward which in turn rotates the pinion. Pinion assembles to dynamo to generate electricity as a source of energy is battery.

Keywords: Energy Generation, Toll Plazas, Storage of Energy

1. Introduction

In our research we have found that a lot of energy due to friction is lost while vehicle passes over the speed breaker. So, we have discovered that energy can be utilised for generation of electricity. This can be done by replacing conventional breakers with roller mechanism which will be installed on toll plazas where speed of vehicles is constant increasing the efficiency of the system.

1.1. Roller Mechanism

In this mechanism the electricity is generated by using which can be mounted at toll plazas of national and state highways instead of speed breaker. When the vehicle passes over the speed breaker the roller rotates and rotates the shaft which is further connected to the generator and due to which the electricity is generated which gets stored in the battery and further can be further used to lighten the street lights on the roads, traffic lights etc.

Figure 1.1 Power generation from speed breaker using roller mechanisim

2. The idea of electricity from speed breaker

As we all know that the population of our country is drastically increasing day by day due to which demand for electricity is also increasing. Moreover the number of vehicles on roads is also rapidly increasing and if some of the Kinetic energy of these vehicles is converted into rotational motion of generator then a considerable amount of electricity can be produced.

Figure 2.1 Speed breaker

3. Energies involved in this method

Three types of energies are taking part in this conversion in order to generate electricity.

3.1 Kinetic Energy

Due ro virtue of motion as a energry possessed is Kinetic energy.

3.2 Mechanical Energy

Mechanical energy exhibit due to position and motion of object.

3.3 Electrical Energy

As a particle charged and energy stored due to electric field is electrical energy.

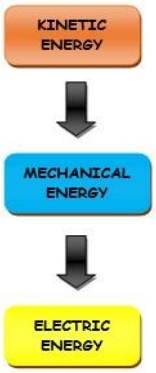

Figure 3.1 Energy Conversion

The basic energy conversion taking place is first from kinetic energy to mechanical energy and then from mechanical energy to electrical energy

4. Equipment required for the system

4.1 Ball bearings

Figure 4.1 Ball bearing

A ball bearing Which uses ball and bearing and maintain the gap in between them.To allow the relative motion by carrying loads. The relative motion between the components causes the balls to roll with little sliding. The ball bearing is used to reduce friction and transmit the motion effectively.

4.2 Spur Gear

A gear is a rotating element which has teeth that mesh with some other part having teeth in order to transmit torque. It should have high resistance for wear and tear, and high capacity to absorb shock.

Figure 4.2 Spur gear

4.3 Sprocket and Chain drive

It is a profiled wheel with teeth that can mesh with a chain, or other perforated material. Sprocket is generally a wheel upon which radial projections engage a chain passing over it. Chain drive is used to connect the sprockets in order to transmit power.

Figure 4.3 Sprocket

4.4 Pawl and Ratchet

A mechanical device which allows motion in only one direction is called ratchet. The ratchet is a gear which has teeth and it is circular in shape. The pawl is a spring loaded hook type structure which is pivoted at one end and the other end makes contact with the teeth of the ratchet.

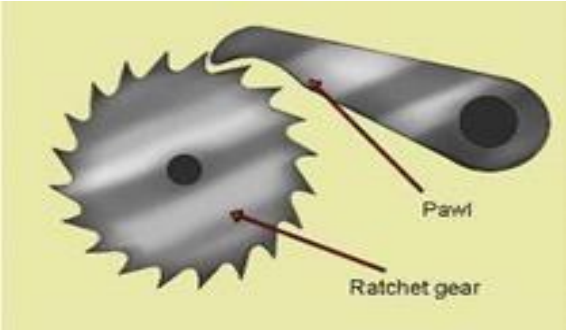

Figure 4.4 Pawl and ratchet

4.5 Flywheel

The primary or main function of the flywheel is to reduce the fluctuations in speed. It is known as an energy accumulator. The flywheel proves to be of great help as, it absorbs extra energy and stores it when demand is less, and releases this stored energy when the demand increases.

Figure 4.5 Flywheel

4.6 Shaft

Transmit power from one component to another as a primarily rotating element.

Figure 4.6 Shaft

4.7 Generator or Dynamo

Transmission of power from mechanical to electrical by uses dynamo which are having rotating coils of magnetic field and wire**.**

Figure 4.7 Generator

4.8 Battery

It is a device which stores energy generated from the generator.

5. Power Calculations

Weight of cars vary from 1200 kg -2000 kg (for an average car) approx. The power generation may be greater for heavy vehicles such as trucks, buses etc. The speed breaker height is generally up to 10 cm (Eastleigh Borough Council, 27 Sept 2006). If averagely, 1500 kg weight and 10 cm height is considered then approx.

(1 N-m = 1 Joule)
1 N-m/s = 1 Watt

Power = Work done /s

Weight of car (W) = mg m = mass of car
g = gravitational acceleration = 9.81 m/s^2
W = 1500 * 9.81
W = 14715 N
Work done = Weight * displacement (i.e. height of breaker)
= 14715 * 0.10
= 1471.5 N-m
= 1471.5/60
= 24.52 W

Work done = 24.52 Watts

Power = 24.52 Watts for 1 minute
For 60 minutes (1 hour) = 24.52 * 60 = 1471.5 W For 24 hours (1 day) = 1471.5 * 24 = 35316 W Approx.
35.31 kW of power generated **per day**.

6. Advantages

1) We can have annual electricity generation with the help of this method without depending on other factors.
2) Power generation takes place reasonably and by using non-conventional energy sources which will help to preserve the conventional energy sources for our adjacent future demand.
3) There is no usage of any fossil fuel hence electricity is generated by renewable means.
4) Pollution less energy generation (A. S. Fawade, 2015).

5) Simple construction, mature technology and easy maintenance.
6) This method requires less measure of floor area and also the traffic is not obstructed.
7) It is economical and not difficult to install.
8) This method is promising due to its good efficiency and energy recovery criteria.

7. Applications

1) Street Lights
2) Traffic Signals lights
3) Boards near about the bus-stops
4) check posts on highways.
5) Sign boards on the roads

8. Conclusion

This mehod adapts a renewable source to generate electricity. To most economical and reliable method to generate electricity. The development of a country is directly proportional to the way in which it uses power supply sufficiently and efficiently. Now is the need of an hour when these types of inventive ideas should be brought into practice. This idea not only provides an alternative, but also adds to the economy of the country. Development of every country is the development of the world.

References

[1] R.D.Sharma, S.Jain, K.Singh, "Growth rate of motor vehicals in India", Journal of economics and social studies, Vol.I, 2011
[2]A.Padam Rao,"Power generation from speed breaker by rack and ratchet method", International Journal of Current Engineering and Technology Issue-2, Februry,2014
[3]S. Srivastava, A. Asthana,"Produce electricity by the help of speed breakers", Journal of engineering research and studies, Journal of Engineering Research and Studies, Vol.II, April-June,2011
[4]A. Mishra, P. Kale, International Journal of Engineering and Science, Vol. II, March 2013
[5]G.R.Prabu, G.Ethiraj, International Journal of Advanced Research in Electrical,Electronics and Instrumental engineering, Innovation in Engineering and Technology (IJIET) Vol.2 Issue 2, March 2013.
[6]R.Gupta, S.Sharma, "A Revolutionary Technique of Power Generation from speed breaker, International Journalof Engineering Research and technology, 2013.
[7]Amol Sheshrao Fawad, Air Compression and Electricity Generation by Using Speed Breaker with Rack And Pinion Mechanism, International Of Modern Engineering Research (IJMER) Vol.5 Issue 1, January 2015.
[8]Ankita, Meenu Bala, Power Generation from Speed Breakers, "International Journal Of Advance Research In Science and Engineering, 2013.
[9]Ashwathamah V Priyadharshini M.,"International Journal of Recent Research and Review," Vol. I, ISSN 22778322, March2012.
[10]"Every speed breaker is now a source of power", IPCBEE Vol.1, 2011.
[11] Sharma.P.C , Principle of renewable energy systems (Public printing service, New Delhi, 2003).
[12].Sharma.P.C, Non-Conventional power plants (Public printing service, New Delhi, 2003).
[13].Mukherjee.D Chakrabarti.S,Non-conventional power plants (Public printing service, New Delhi, 2005).
[14].Ankita, Meenu Bala, Power Generation From Speed Breakers , International Journal Of Advance Rese arch In Science and Engineering , 2(2), 2013.
[15].Miller R, Power System Operation, (McGraw-Hill, New York, 1970).