Power Generation from Rolling Mechanism

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Abstract **- The world is facing energy crisis with the difference in demand and supply and limited number of natural resources. So there is a need for saving energy and requirement an alternate energy source which is available and feasible. This project attempt to concentrate on how electrical energy can be generated from busy road using speed breaker, stored and used. In large metro cities the number of vehicles increases gradually. Another way to generate the power by tapping this energy is possible by replacing normal speed breaker with this simple mechanism. The energy generated is stored for lighting street lights and for use in rural areas**

I. INTRODUCTION

With rise in population, the distribution of energy and power generation has become challenging daily for the transition from usage of conventional energy to nonconventional is highly required in current scenario. As the availability of the conventional energy sources such as fossil fuels are the main sources for power generation for current time period new innovations would still be heavily required towards direction of green energy generation. The green energy utilization can change the recurrent impact on environment by the pollution levels while creating an un-biased distribution of electricity. Constant usage of the conventional based energy system environment has suffered and so has mankind. It is also clear that the technological advancement has also not yet reached to a stage where the non-conventional methods can replace the conventional. The Electro-Kinetic power generator is capable of generating around 10kW of electricity which can then be used to power road signs, traffic lights and street lights or stored in batteries for future use. The track is made up of metal rollers that rotate by using the pressure exerted by vehicles passing over it. The movement of the rollers drives a specially developed design, which in turn drives a generator to produce electricity. The repeated rotations from the rollers, which is further attached to another free wheel allowing it to spin freely in-between while vehicles passes over the track. There is a little literature about extraction of kinetic energy from flow of vehicle in the streets. These proposed systems mostly small radial flux generators with ineffective topologies have been employed.

II. LITERATURE REVIEW

Environment degradation due to consistent energy spending needs a rational and pragmatic approach, using non-conventional renewable methods for drawing energy can help sustain the environment while creating green energy.

In India, the power consumption has spurred so much that under the 12th Plan, the total capacity addition for power generation was 88537 MW, against this, the actual capacity added till December 2014 was 49058. 22 MW. (Commission, 2012) This shows that a need to use other methods for power generation and distribution is required. Use of speed breakers so as to generate electricity is one of the techniques which can help curb the energy crises as well as pollution generated through fossil fuel based energy consumption.

Aniket Mishra (2013) invented a technique to create electricity in rural areas that lack sufficient distribution. A similar approach was started in South Africa as their current electrical crisis in opposition to their heavy demand made them to implement this method to light up small villages of the highway. Techniques that are used both in India and South Africa are Air Piston mechanism, Rack and Pinion mechanism, and Roller mechanism.

Kanak Gogoi (2012) project claims to generate sufficient energy which can be used for sustaining street lights. However, the only problem with the mechanism is that is workable and efficient for vehicles that are above 1000kgs, this raises the concern for the two wheelers as well. The breakers are large in size which also creates a concern for installment and deep excavation which makes it costly.

Piyush Bhagdikar (2012) proposed a model which is based on roller mechanism was developed by VIT University Chennai Campus, uses rollers which generates electricity. The setup uses simple rollers that use the vehicular motion as a mechanism to spin off the rollers which in turn is transformed into energy. With a single run of 2 wheeler, 0.06W/tire is produced through the model.

However, the roller mechanism is not self-capable to generate electricity and the usage of rollers in the model are not optimum in size, which makes a concern for proper movement of the rollers in order to generate sufficient energy.

Therefore, the conveyor mechanism creates optimum grip within the roller mechanism in order to generate electricity, the purpose of the conveyor is not only to generate the sufficient electricity but also to create minimal friction which is also one of the functions of speed breakers. In the conveyor roller mechanism the rollers are also large in size which can hold the sufficient weight of the different type of vehicles.

a.SHAFT

A Shaft is a element used to transmit power and torque and it can support reverse bending (fatigue).Most shaft has circular cross section, either solid or tubular. The difference between a shaft and an axle is that the shaft to transmit power and that it is subjected to fatigue. A axle is just like round cantilever beam so it is not subjected to fatigue

b. ROLLER

Speed breakers are used to slow down the speed of vehicle by offering a resistance on wheels. It is in strips in two to five numbers lying parallel to each other on the road. It can be easily seen on railway crossings. We can use number of the speed breaker either to resist the vehicle or to get the more electricity. Material of vehicle we can use wood, steel, etc

d.CHAIN

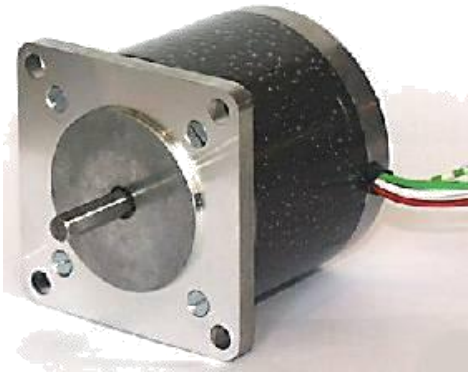
c.BEARING

A bearing is a device to allow constrained relative motion between two or more parts, typically rotation or linear movement. Bearings may be classified broadly according to the motions they allow and according to their principle of operation as well as by the directions of applied loads they can handle.

Chain is a way of transmitting mechanical power from one place toanother. It is also used in awide variety of machines besides vehicles. Most often, the power is conveyed by a roller Chain, known as the chain or transmission chain passing over a sprocket gear, with the teeth of the gear meshing with the holes in the links of the chain.

e.STEPPER MOTOR

A stepper motor is an electromechanical device which converts electrical pulses into discrete mechanical movements. The shaft or spindle of a stepper motor rotates in discrete step increments when electrical command pulses are applied to it in the proper sequence.



f.GEAR DRIVE

Spur gears or straight-cut gears are the simplest type of gear. They consist of a cylinder or disk with teeth projecting radially. Though the teeth are not straight-sided but usually of special form to achieve a constant drive ratio, mainly in volute but less commonly cycloid the edge of each tooth is straight and aligned parallel to the axis of rotation.

g.BATTERY

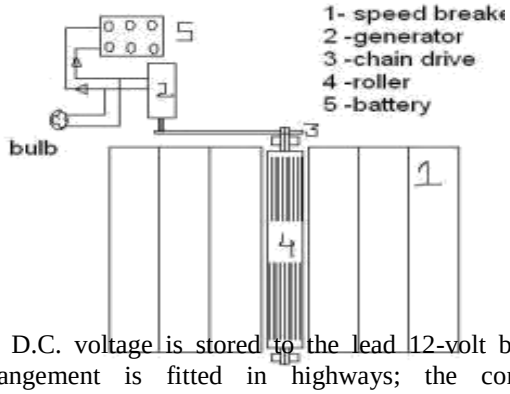
Batteries convert chemical energy directly to electrical energy. A battery consists of some number of voltaic cells. Each cell consists of two half-cells connected in series by a conductive electrolyte containing anions and cations. One half-cell includes electrolyte and the negative electrode, the electrode to which anions (negatively charged ions) migrate the other half-cell includes electrolyte and the positive electrode to which cations (positively charged ions) migrate. Red ox reactions power the battery.

h.LED

This phenomenon is generally called electroluminescence, which can be defined as the emission of light from a semi-conductor under the influence of an electric field. The charge carriers recombine in a forward-biased P-N junction as the electrons cross from the N-region and recombine with the holes existing in the P-region.

III. WORKING PRINCIPLE

The bearing is provided in order to permit the relative motion between the shafts. In this way vertical motion is to be converted intorotational motion. The one end of the shaft will be fixed with the help bearing. The working of this speed breaker arrangement for producing electricity is very simple. The ball bearings are connected in one side of roller in this project. At one side ball bearing is used to make the linear and smooth rotation of roller. At the second side synchronous AC motor hasbeen connected through mechanical coupling. As the roller rotates because of vehicle motor also starts to rotate due to which electricity is being produced. . The speed breaker on a busy road will be lifted to some height from one side and fixed to the road from other side. There are a large number of automobiles running on the road. These automobiles go over a number of speed breakers present on the road. The vehicle is having a variety of weight like trucks, buses, cars, and two wheelers therefore whenever they are passing over a speed breaker a lot of energy is wasted. So when the vehicle will come on the speed breaker, electricity produced by motor which acts as a generator because it get rotated linearly with the speed breaker due to coupling of speed breaker with motor shaft.



This D.C. voltage is stored to the lead 12-volt battery. This arrangement is fitted in highways; the complete arrangement is kept inside the floor level except the speed brake arrangement. Here we are making speed breaker, when a vehicle crosses the speed breaker the speed breaker will rotate on the basis of weight and the speed of the vehicle. That output of stepper motor voltage is given to the application which being implemented such as street light and traffic light. The produced voltage can also be given to the battery to store the electricity. Through battery we give supply to the port of microcontroller through which traffic light operates. Then the output of the battery is used to lighten the street lamps on the road. Now during daytime 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.

MERITS

- Pollution free power generation.
- Simple construction and easy maintanenance.
- 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.
- No fuel storage is required.
- It will work with light weight and heavy vehicle.
- Economical and easy to install.

DEMERITS

- We have to check mechanism from time to time.
- It can get rusted in rainy season.

APPLICATIONS

- To provide electricity in villages near to highway, to fed power directly to smart grid.
- In street lights, Tollbooths, Traffic signals.
- It can be placed in commercial building i.e. theatre, shopping mole, public/private parking etc. where use for light bulbs.
- As a charging station for electric vehicle.

IV.SCOPE OF PROJECT

- India has huge source of non conventional energy like huge coastal area, hilly areas and bright sunlight uninterruptable.
- The effective utilization of is useful in the development of nation non conventional energy sources.
- The utilization of energy is an indication of the growth of a nation. For example, 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 being needs to consume more and more energy.

A recent survey on the energy consumption in India had published a pathetic report that 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 technologies are needed in this field. India, unlike the top developed countries has very poor roads.
- Talking about a particular 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 tapped.
- 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 power to these villages.

V. CONCLUSION

No one is happy with current situation of electricity in India We need electricity for every small thing.

More suitable and compact mechanisms to enhance efficiency. Although we get less electrical output, this is a simple idea for generating electricity from kinetic energy of the moving vehicles. If this concept is further developed and is produced in high potential, I am confident that enormous amount of power can be developed. These rollers can be designed for heavy vehicles, thus increasing input torque and ultimately output of generator by using the multiple transmission system which is more efficient method.

REFERENCE

- Annamalai Arunachalam, Eco-friendly Electricity generation: Electricity from speed-breakers, India, 2011.
- Awasthaman.V&Priyadarshini. M, Every Speed Breaker is Now a Source of Power, IPCBEE vol.1, Singapore,
- P.M.Anderson and A.AFouad.PowerSystem Control and Stability.
- Mohsen Artodezfoli, AbbasRezaey, 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,Text Road Publications, 2012.
- M.D. Singh & K. Khan Chandani, Power Electronics, Tata McGraw Hill 1998 Edition
- M H Rashid, Power Electronics, 3rd Ed., Pearson Education, 2009.
- B. G. Streetman and S. Banerjee, Solid state electronics devices, 5th Edition, PHI. 2011.