POWER GENERATION FROM SPEED BREAKER

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ABSTRACT:

In the present scenario power becomes major need for human life. Due to day-to-day increase in population and lessen of the conventional source, it becomes necessary that we must depend on non-conventional source for power generation. While moving, the vehicles posses 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".

The kinetic energy of moving vehicles can be converted into mechanical energy of the shaft through rack and pinion mechanism. This shaft is connected to the electric dynamo and it produces electric energy proportional to traffic density .this generated power can be regulated by using Zener diode for continuous supply .All this mechanism can be used for general purpose like street lights, traffic signals.

This generated power can be amplified and stored by using different electric devices. The maintenance cost of hump is almost nullified. By adopting this arrangement, we can satisfy the future demands to some extent.

KEYWORD: *speed breaker, Rack and pinion and chain sprocket arrangement, Dynamo, Battery, Street light*

I. INTRODUCTION

Increasing demand of energy adds needs of identifying non-conventional resources of energy. In this article, we will discuss about power generation from speed breaker and all the possible mechanism required for it.

1 .Principle Fundamental

This paper is simply based on utilizing potential energy of a vehicle passing over a road breaker by converting it to electrical energy can be store in batteries or can be directly use to light up street light or traffic signals. By using such system which can be convert potential energy of a vehicle in to electrical energy we can generate a large amount of energy. This large amount of electricity will reduces the burden of demands.

System required to facilitate the power generation from speed breaker we need an assembly of different system we can classify this system as-

1.1 Damper system

1.2 Motion conversion system

1.3 Electricity converter

To make this conversion possible the whole plan of action is like as the vehicle passes over the breaker of the system damper system a system will provide support to speed breaker and due to weight of the vehicle breaker will go down and motion conversion system will convert downward linear motion into rotary motion. This rotator motion will be feed to energy conversion system. It will convert mechanical energy to electrical energy.

1.1 Damper system

Damper system is required to support the speed breakers. Once the speed breakers are pushed down then a damper system will be required to absorb the shocks produced during the passage of vehicles over the speed breakers.

1.2 Motion conversion system

Motion conversion system converts linear vertical motion into rotary motion. To complete this conversion of motion, a rack and pinion mechanism is applied. Rack and pinion mechanism consists of two parts. First is rack, it is the flat, toothed part, performing linear motion. Second is pinion, it is a gear in wheel form, producing rotary motion. So this conversion system is called motion conversion system.

1.3 Energy conversion system

Energy conversion system is required to convert mechanical energy into electrical energy .Rotary motion is obtain as the output of pinion (or of gear box), which is coupled with a dynamo. Dynamo generates electricity with the help of input rotary motion. The electrical energy is obtained as the output of the dynamo.

In addition to this, a stepper motor is coupled to the rotary motion obtain from the other set of rack and pinion. Stepper motor is applied to enhance the generated power. In a dynamo electricity is generated by dynamo electricity is generated by cutting of magnetic lines by a conductor.

2. Energy estimation

When the vehicle moves over the speed breaker it reduces its speed. As these breaker 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 energy single minute. This paper needs a lot research work as it can be proved a non-conventional resource of energy.

II. WORKING PRINCIPLE

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 utilizes both mechanical technologies and electric l techniques for the power generation and its storage. POWER HUMP is a dome like device likely to be speed breaker.

Whenever the vehicle is allowed to pass over the dome it get pressed downward then the springs are attached to the dome are compressed and the rack which is attached to the bottom of the dome moves downward in reciprocating motion. Since the rack has teeth connected to gears, there exists conversion of reciprocating motion of motion of rack into rotary motion of gear but the two gears rotate in opposite direction. A flywheel is mounted on the shaft whose function is to regulate the fluctuation in the energy and to make the energy uniform. So that the shaft will rotate with certain R.P.M. these shaft are connected through a belt drive to the dynamos, which converts the mechanical energy into electrical energy. The conversion will be proportional to traffic density.

Whenever an armature rotates between the magnetic field s of south and north poles, an E.M.F. (electro motive force) is included in it. So, for including the EMF armature coil has to rotate, for rotating this armature it is connected to a long shaft. By rotating same e.m.f. is induced, for this rotating kinetic energy of moving vehicles is utilized. The power is generated in both the direction ; to convert this power into one way , a special component is

used call zener diode for continuous supply .all this mechanism can be housed under the dome, like speed breaker, which is called HUMP. The electrical output can be improved by arranging these POWER HUMPS in series. This generated power can be amplified and stored in battery.

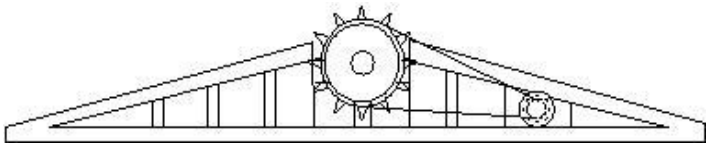

Fig.2 Side view of speed breaker

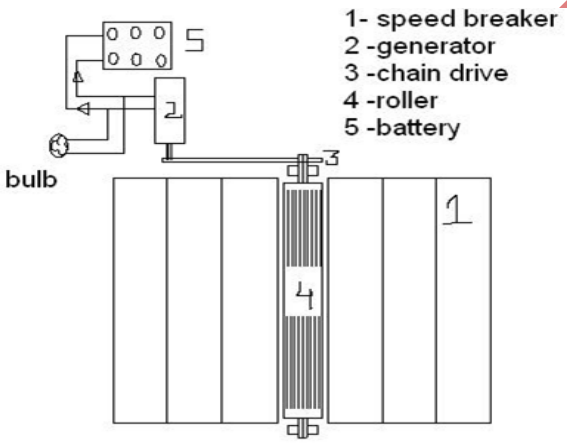

Fig.2 Top view of speed breaker

III. MATERIAL REQUIRED

The various machine elements used in the construction of power hump are:

3.1 Rack

3.2 Pinion

3.3 Gear Arrangement

3.4 Chain

3.5 Shaft

3.6 Spring

3.7 Ball Bearing

3.8 Sprocket

Rack and pinion: A rack and pinion is a type of linear actuator that comprises a pair of gears which convert rotational motion into linear motion into linear motion. The circular pinion engages teeth on a linear gear bar-the rack. Rotational motion applied to the pinion will cause the rack to move to the side, up to the limit of its travel.

For example, in a rack railway, the rotation of a pinion mounted on a locomotive or a railcar engages a rack between the rails and pulls a train along a steep slope. The rack and pinion arrangement is commonly found in the steering mechanism of cars or other wheeled, steered vehicles. This arrangement provides a lesser mechanical advantage than other mechanisms such as recalculating ball.

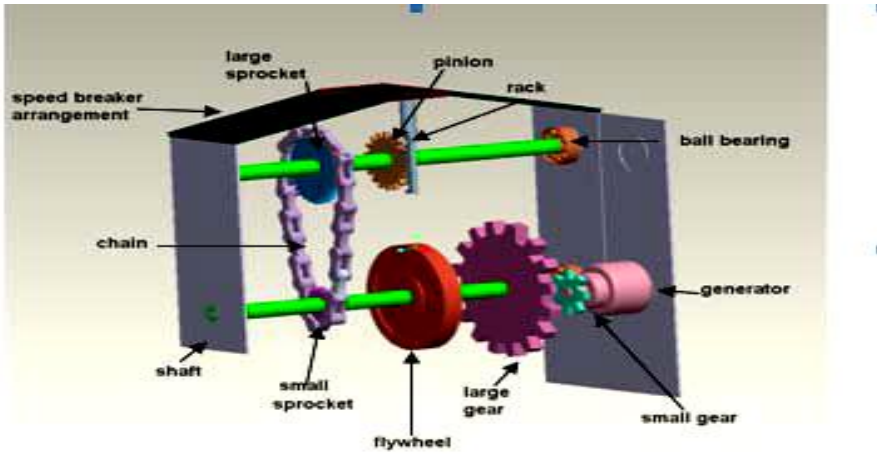

Fig.3 Material used in speed breaker

Gear arrangement: The primary function of flywheel is to act as an energy accumulator. It reduces the functions in speed. It absorbs the energy when demand is less and releases the same it is required.

Chain: It is used to connect the small sprocket and large sprocket.

Shaft: It is a rotating element which is used to transmit power from one place to another place. It supports the rotating element like gear and flies wheels. It must have high rigidity.

Spring*:* It defined as a elastic body whose function is to distort when loaded and to recover its original shape when load is removed. It absorbs or control energy either due to shocks or due to vibrations.

Ball Bearings: It is machine element, which support machinery. It permits relative motion between the contacting surfaces while carrying the loads. They reduce the friction and transmit the motion effectively.

Electric Dynamo: It is a device, which converts mechanical energy into electrical energy. It works based on FARADAY'S laws of electromagnetic induction.

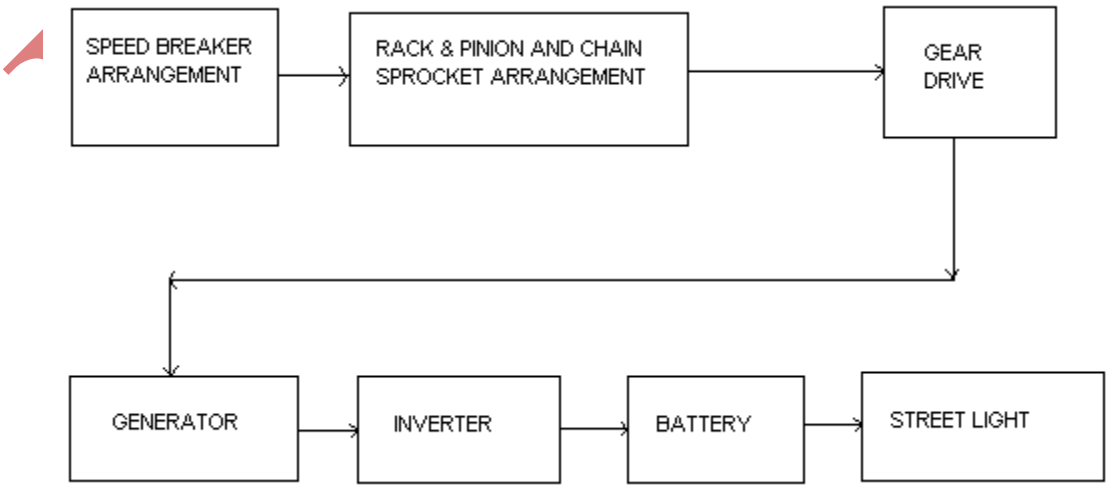

Fig.4.Block Diagram of power generation from speed breaker

IV. CONCLUSION

The life of POWER HUMP id estimated to be 6 years. So the customer will get free power generation for 4 years period. As it does not utilize any external source and traffic will never be reduced .these power humps are more reliable, and have more life than any other power source.In this world where there is shortage of electrical power supply, this paper will be helpful to solve some of the problem.

We can generate more amount of electricity. We can lighten our street lamps. Pollution free power generation. Energy available all year round, No fuel transportation problem. No consumption of any fossil fuel which is nonrenewable. Extra electricity can be send to villages' also. No manual work necessary during generation. Energy available all year round.

We can produce 240V/230V with 5-10 A power smoothly. A control system for an AC excited synchronous machine for use in an electricity generator / motor system.

REFERENCE

[1] Aswathaman.V , Priyadharshini M. , *"International Journal of Recent Research and Review,"* Vol. I, ISSN 2277-8322, March 2012

[2] Sharma.P.C , "*Principle of renewable energy systems*", ,2003.

[3] Sharma.P.C, "*Non-Conventional power plants, Public printing service*" , New Delhi, 2003.

[4] Weedy, B., "*Electric Power Systems*", Wiley, New York,1967.

[5] Mukherjee.D Chakrabarti.S, "*Fundamentals of renewable energy system,*" New Age international limited publishers,New Delhi, 2005.

[6] Mukherjee.D Chakrabarti.S , "*Non-conventional power plants*", 2005

[7] Mukherjee.D "*Fundamental of renewable energy systems*", New Age international limited publishers, New Delhi, 2007.

[8] Gannon, Thomas. "*Newport Mansion: the Gilded Age."* Fort Church PublisAhers, Inc., 1982:p.8.

[9] Miller, G. Wayne "*Fortune's Children". A nearly Perfect Summer*" , Providence Journal, 2000.

[10] Cohn, N., *"Control of Generation and Power Flow on Interconnected Systems,"* Wiley, New York, 1961.

[11] Miller, R., "*Power System Operation"*, McGraw- Hill, New York, 1970.

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