Power Generation Using Speed Breaker with Auto Street Light

Amanpreet Kaur1, Shivansh Kumar Singh[2], Rajneesh[3], Parwez4, Shashank[5]

AP, EIE Dept, Galgotias College of Engineering and Technology, Gr. Noida, U.P[1]

Student, EIE Dept, Galgotias College of Engineering and Technology, Gr. Noida, U.P [2,3,4,5]

Abstract— In the present day scenario, power is a major need for human life. There is a need to develop non-conventional sources for power generation due to the reason that our conventional sources of power are getting scarcer by the day. This paper emphasises on the idea that the kinetic energy getting wasted while vehicles move can be utilized to generate power by using a special arrangement called "power hump". This generated power can be used for general purpose applications like streetlights, traffic signals. In addition, we could also have solar panels, which would satisfy our power needs, when there is no vehicular movement.

Index Terms **- Kinetic energy, Speed breaker, Electro-mechanical unit, Electric dynamo, Non-Conventional Energy.**

I. INTRODUCTION

In the present day scenario power has become the major need for human life. Energy is an important input in all the sectors of any countries economy. The day-to-day increasing population and decreasing conventional sources for power generation, provides a need to think on non-conventional energy resources [1][2]. Here in this paper we are looking forward to conserve the kinetic energy that gone wasted, while vehicles move. The number of vehicles passing over speed breaker on road is increasing day by day. Beneath speed breaker, setting up an electro-mechanical unit known to be power hump, could help us conserving this energy and use it for power generation. The electrical output can be improved by arranging these power humps in series. This generated power can be stored, by using different electrical devices. We can supply this energy to street lights, traffic lights, and nearby areas, and thus helps in country's economy. We could make it more efficient, by also having a solar panels that provides for power needs while the vehicles were not moving [3][4].

II. LITERATURE REVIEW

The energy crisis is any great bottleneck in the supply of energy resources to an economy. The studies to sort out the energy crisis led to the idea of generating power using speed breaker. Firstly, South African electrical crisis has made them implemented this method to light up small villages of the highway. The idea is basic physics, to convert the kinetic energy into electrical energy that gone wasted when the vehicle runs over speed-breaker [5]. Since then, a lot has been done in this field. An amateur innovator, Kanak Gogoi in Guwahati has developed a similar contraption to generate power, when a vehicle passes over speed-breaker. The idea has caught the eye of IIT-Guwahati, which funded the pilot project related to generate electricity from speed-breakers. They has evaluated the machine and recommended to the Assam government. Their work has provided the need to think on this alternative to generate electricity on the large scale, as it proves to be a boon to the economy of the country.

III. PROPOSED SYSTEM

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, as shown in Fig.1. It is an Electro-Mechanical unit. . All this mechanism can be housed under the dome, like speed breaker, which is called Hump [6]. It utilizes both mechanical technologies and electrical techniques for the power generation and its storage.
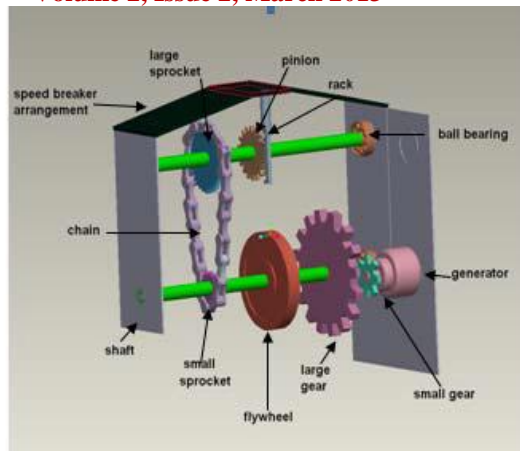
Fig.1 Power Hump

Whenever the vehicle is allowed to pass over the dome it gets pressed downwards, then the springs that 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 rack into rotary motion of gears 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 the shafts will rotate with certain rpm. These shafts are connected through a belt drive to the dynamos, which converts the mechanical energy into electrical energy. The conversion will be proportional to the traffic density [7].
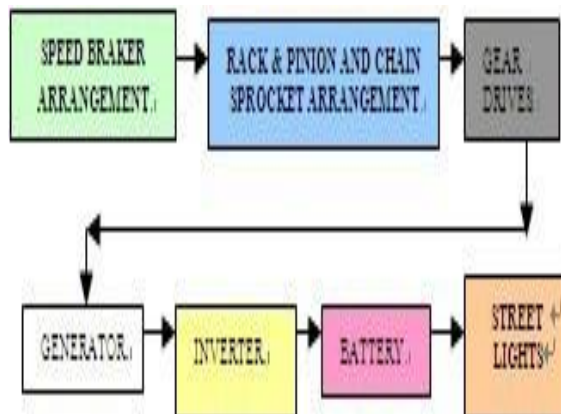

Fig.2 Block diagram

Whenever an armature rotates between the magnetic fields of south and north poles, an E.M.F (electro motive force) is induced in it. So, for inducing this E.M.F. armature coil has to rotate, and for rotating this armature it is connected to a long shaft. For this rotation kinetic energy of moving vehicles is utilized. The power is generated in both the directions; so to convert this power into one direction, a special component is used, called zener diode, for continuous supply. The electrical output can be improved by arranging these POWER HUMPS in series. This generated power can be amplified and stored by using different electrical devices. The block diagram describing the whole process is shown in Fig.2.

IV. EQUIPMENT REQUIRED

A. RACK AND PINION GEARS:
The rack and pinion used to convert between rotary and translatory motion. The rack is the flat toothed part, while the pinion is the gear. Rack and pinion can convert rotary to linear of from linear to rotary motion [8].
B. BALL BEARINGS:
A roller-element bearing is a bearing which carries a load by placing round elements between the two pieces. The relative motion of the pieces causes the round elements to roll(tumble) with little sliding. They reduce the friction and transmit the motion effectively.

C. SPUR GEAR:

It is a positive power transmission device with definite velocity ratio. It is preferred for adjusting some linear misalignment. It should have high wear and tear, shock-absorbing capacity.

D. FLY WHEEL:

The primary function of flywheel is to act as an energy accumulator. It reduces the fluctuations in speed[9]. It absorbs the energy when demand is less and releases the same when it is required.

E. SHAFTS:

It is a rotating element, which is used to transmit power from one place to another place. It supports the rotating elements like gears and flywheels. It must have high torsional rigidity and lateral rigidity.

F. SPRINGS:

It is defined as an elastic body whose function is to distort when loaded and to recover its original shape when the load is removed. It cushions, absorbs or controls energy either due to shocks or due to vibrations [10].

G. ELECTRIC DYNAMO:

It is a device, which converts mechanical energy into electrical energy. The dynamo uses rotating coils of wire and magnetic fields to convert mechanical rotation into a pulsing direct electric current through "faraday's law of electromagnetic induction". A dynamo machine consists of a stationary structure, called stator, which provides a constant magnetic field, and a set of rotating winding called the armature which turns within that field.

V. OBSERVATIONS

As far as the experiment concerns, we have two related observations with regard to the voltage generated to the variations in speed and load [11]. The following were the two illustrations:

a). Let us consider the load(heavier vehicle) is constant on the speed breaker. Now we have the voltage produced, to the variations in the speed of the vehicle. If the vehicle runs slowly then it certainly applies the pressure on the speed breaker for a long time so the voltage produced will be most in this case. While we keep on increasing the speed, the vehicle rushes over the speed breaker, the pressure keep on decreasing so as the voltage produced. The graph plotted between these two variables [14][15], is shown Fig.3.
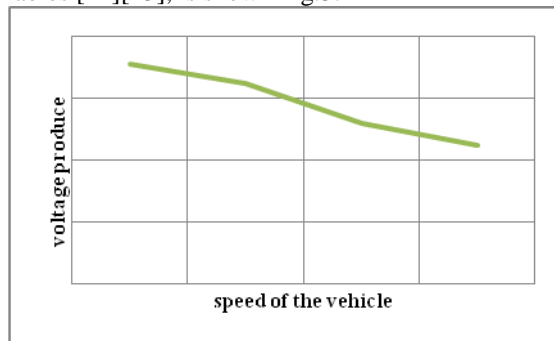

Fig.3 Voltage produced vs Speed of the vehicle

b). Let us consider the speed (usually low) of the vehicle is kept constant on the speed breaker. Now we have the voltage produced, to the variations in the load (vehicles) applied on the speed breakers. Assume, if the vehicle that runs over it has the least load capacity compared to others then it certainly applies a very less pressure that result in a least voltage produced. Now as the load keep on increasing, the voltage produced also kept increasing because the pressure on breaker keeps increases with the load. The graph showing the relationship between these two variables is shown in Fig.4 [14] [15].
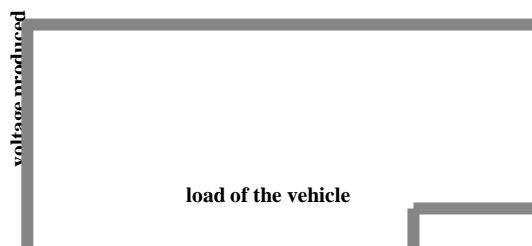

Fig.4 Voltage produced vs. Load of the vehicle

VI. ADVANTAGES

Below is the list of advantages due to the usage of the technique mentioned in this paper.

- Pollution free power generation.
- Simple construction, mature technology and easy maintenance.
- No consumption of any fossil fuel which is non-renewable source of energy.
- No fuel transportation required.
- No external source is needed for power generation.
- Energy available all year round.

VII. CONCLUSION

In coming days, this will prove a great boon to the world, since it will save a lot of electricity of power plants that gets wasted in illuminating the street lights. As the conventional sources are depleting very fast, then it's time to think of alternatives. We got to save the power gained from the conventional sources for efficient use. So this idea not only provides alternative but also adds to the economy of the country. Now, vehicular traffic in big cities is more, causing a problem to human being. But this vehicular traffic can be utilized for power generation by means of new technique called "power hump". It has advantage that it does not utilize any external source [12]. Now the time has come to put forte these types of innovative ideas, and researches should be done to upgrade their implication.

REFERENCES

[1]. Sharma, P.C., "Non-conventional power plants", Public Printing Service, New Delhi, 2003.

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

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

[4]. Sharma, P.C., "Principles of renewable energy systems", 2003.

[5] Watts,G., "Effects of speed distribution on the Hormonoise model predictions", Inter-noise Conference, Prague, 2004.

[6]. Shirley. "Smart road hump will smooth the way for safe drivers", Providence Journal, November 11, 2005

[7]. Dr. Anders Brandt & MSc. John Granlund Swedish Road Administration. "Bus Drivers Exposure to Mechanical Shocks Due To Speed Bumps". Society for Experimental Mechanics, IMAC 25th Conference and Exposition on Structural Dynamics 2008.

[8]. P.M. Anderson and A.A. Fouad, 'Power System Control and Stability', Galgotia Publications.

[9]. 'Power System Dynamics and Control', K.R.Padiyar, Interline Publishers Bangalore.

[10]. 'Power System Stabilizers', by Mitsubishi Corporation-A release notes from Mitsubishi Co.

[11]. Hindman Sanchez, "Smart Stopping Speeders in the Community, Smart Speed Bumps reward safe drivers".

[12]. Nota, R., Barelds, R., "Engineering methods for road traffic and railway noise after validation and fine-tuning", Harmonoise, 2005.

[13].Hamet, J.P., Besnard,F., Doisy,S., Lelong,J., "New vehicle noise emission for French Traffic Noise Prediction", 2010.

[14]. "Production of electricity by the method of road power generation", IJAEEE, 2010.

[15]. "Every speed breaker is now a source of power", IPCBEE vol.1, 2011.