

Electricity generation using Power hump with automatic street light control

Kuldeep Singh Chauhan, Ayushi Tomar, Dheeraj kumar, Gaurav kumar

Abstract— Now a days, Electricity is one of the major needs for human life & development ,hence there is a need to develop non- conventional sources for power generation due to the reason that our conventional sources of power are getting used day by day & hence energy conservation is a compulsory thing. This paper emphasises on the idea of the kinetic energy of the vehicles that is getting wasted while vehicles move on the roads & hence this kinetic energy can be utilized to generate power by using a special arrangement called “power hump”. Now this generated power can be used for general purposes like streetlights, traffic signals & even providing the electricity to the nearby villages. In addition, we could also have solar panels with automatic control which would satisfy our power needs, when there is no or less vehicular movement. We will use solar panel in such a way that whenever there will be sunlight, the street lights will remain off & after the sunset street lights will glow automatically

Index Terms— Energy conservation, Electro-mechanical unit, Kinetic energy, Non-Conventional Energy, Power hump, Speed breaker .

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. 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

Kuldeep Singh Chauhan, Electronics & instrumentation department, ITM universe Gwalior, Rajiv Gandhi technical university, Gwalior, India, +918878826581,

Ayushi Tomar, Electronics & instrumentation department, ITM universe Gwalior, Rajiv Gandhi technical university, Gwalior, +918982453910,

Dheeraj Kumar, Electronics & instrumentation department, ITM universe Gwalior, Rajiv Gandhi technical university, Gwalior, India,+918602322004

Gaurav Kumar, Electronics & instrumentation department, ITM universe Gwalior, Rajiv Gandhi technical university, Gwalior, India,+919202287121

more efficient, by having solar panels that provides for power needs while the vehicles were not moving.

II. THEORITICAL 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. 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. FUTURE SCOPE OF THE PAPER

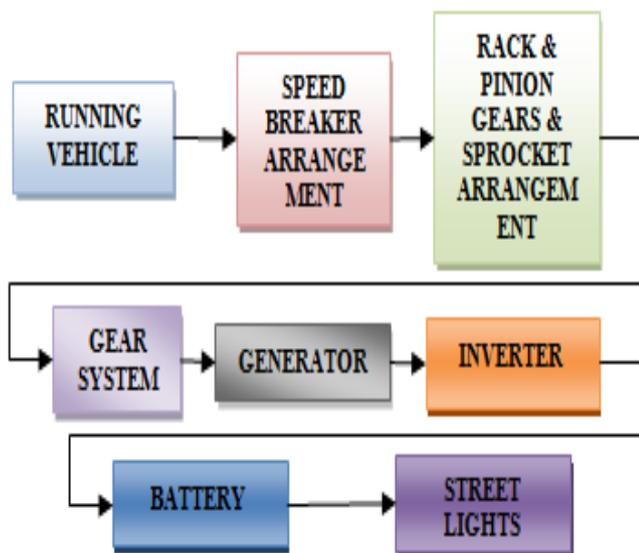
The utilization of energy is an indication of the growth of a nation. For example, the per capita energy consumption in USA is 9000 KWh (Kilo Watt hour) per year, whereas the consumption in India is 1200 KWh (Kilo Watt hour). One might conclude that to be materially rich and prosperous, a human being 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.

IV. PRINCIPLE OF WORKING

The principle of the electric power generation using speed breaker mechanism is very simple. It is based on the same principle as in the case of electricity generation in case of hydroelectric power plant, thermal electric power plant, nuclear power plant, geothermal energy, wind energy, tidal

energy etc. In all of the above power plant mechanical energy is converted into electrical energy .In this setup also mechanical energy is converted into electrical power using a D.C. 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 speed-breaker is converted into rotary motion using the rack and pinion arrangement. The axis of the pinion is coupled with the sprocket arrangement. The sprocket arrangement is made of two sprockets. One of larger size and the other of smaller size. Both the sprockets are connected by means of a chain which serves in transmitting power from the larger sprocket to the smaller sprocket. As the power is transmitted from the larger sprocket to the smaller sprocket, the speed that is available at the larger sprocket is relatively multiplied at the rotation of the smaller sprocket. The axis of the smaller sprocket is coupled to a gear arrangement. Here we have two gears with different diameters. The gear wheel with the larger dimension is coupled to the axis of the smaller sprocket. Hence the speed that has been multiplied at the smaller sprocket wheel is passed on to this gear wheel of larger dimension. The smaller gear is coupled to the larger gear. So as the larger gear rotates at the multiplied speed of the smaller sprocket, the smaller gear following the larger gear still multiplies the speed to more intensity. Hence, although the speed due to the rotary motion achieved at the larger sprocket wheel is less, as the power is transmitted to gears, finally the speed is multiplied to a higher speed. This speed which is sufficient to rotate the rotor of a generator is fed into to 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 an inverter, where the generated emf is regulated. This regulated emf is now sent to the storage battery where it is stored during the day time. This current is then utilized in the night time for lighting purposes on the either sides of the road to a considerable distance.

Block diagram



B. Construction arrangements details

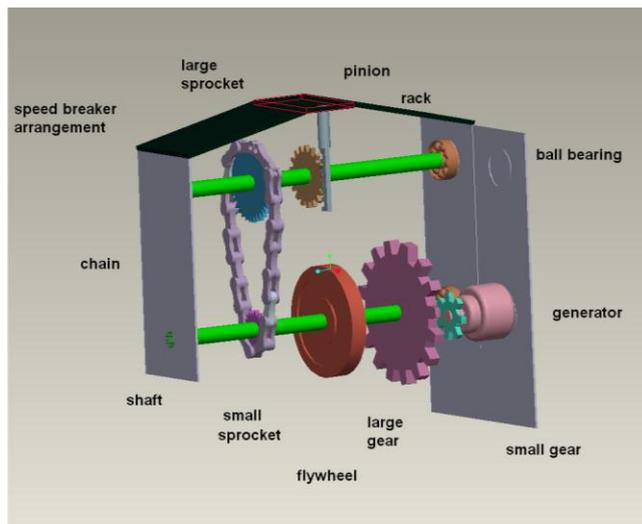


Fig.1. construction arrangements

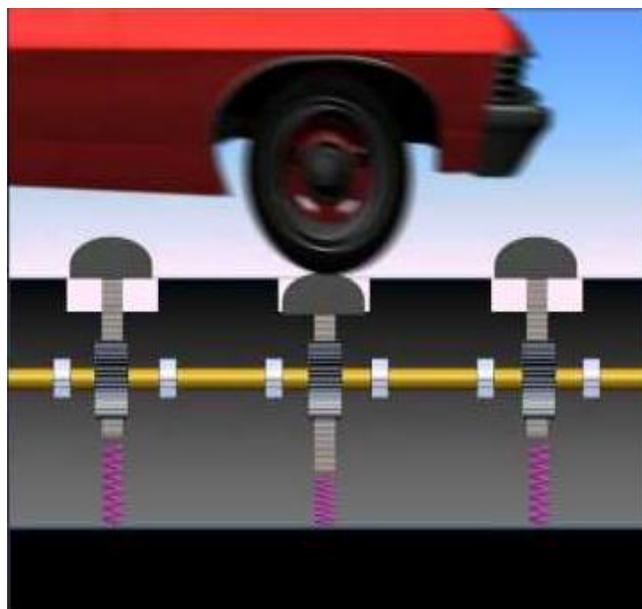


Fig.2. Animated demonstration of process

C. Calculation of Output power generated

Let us consider,
 The mass of a vehicle moving over the speed breaker =250Kg (Approximately)
 Height of speed brake =10 cm
 Work done=Force x Distance
 Here,
 Force=Weight of the Body
 =250 Kg x 9.81
 =2452.5 N
 Distance traveled by the body = Height of the speed brake =10cm
 Output power=Work done/Sec
 = (2452.5 x 0.10)/60

=4.0875 Watts (For One pushing force)

Power developed for 1 vehicle passing over the speed Breaker arrangement for one minute= 4.0875 watts

Power developed for 60 minutes (1 hr.) =245.25 watts

Power developed for 24 hours=5.866 Kw

This is enough power to burn 4-5 street lights on the roads.

D. Efficiency Calculation

$$\text{Efficiency} = [(\text{Output Power}/\text{Input Power}) * 100] \%$$

$$\text{Efficiency} = (2/14.55) * 100\% = 13.75 \%$$

V. EXPERIMENTAL OBSERVATIONS

The experimental investigation is performed by placing the speed breaker arrangement in a pit with a depth of 75 Cm. Vehicles move over the speed breaker arrangement and the voltage generated is measured by a multimeter and the various readings are plotted in a graph. The graphs are drawn for various parameters as shown below

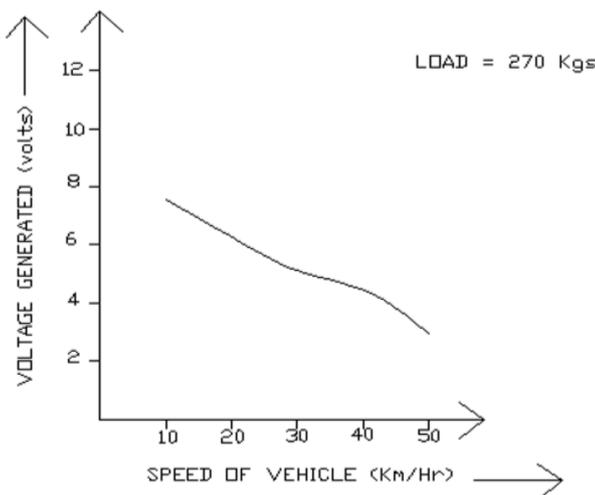
1. Voltage generated (Vs.) speed of vehicle
2. Voltage generated (vs.) Load

A. Voltage generated vs. Speed of vehicle

LOAD = 270 Kg (Vehicle load + man weight)

Readings (Table 1)

| Speed of vehicle (km/hr.) | Voltage generated (volt) |
|---------------------------|--------------------------|
| 10 | 7.93 |
| 20 | 6.28 |
| 30 | 5.03 |
| 40 | 4.66 |
| 50 | 3.03 |

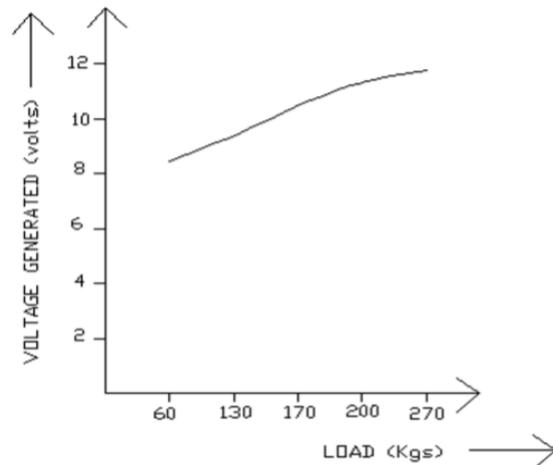


B. Voltage generated vs. load

Speed of vehicle is 10km/hr

Readings (table 2)

| Load (kgs) | Voltage generated(volt) |
|------------|-------------------------|
| 60 | 8.33 |
| 130 | 9.45 |
| 170 | 10.22 |
| 200 | 11.23 |
| 270 | 11.81 |



VI. ADVANTAGES

- 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.
- Pollution free power generation.

VII. CONCLUSION

The utilization of energy is an indication of the growth of a nation. One might conclude that to be materially rich and prosperous, a human being needs to consume more and more energy. And this paper is best source of energy that we get in day to day life.

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