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Production of electricity by the method of road power generation

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Abstract:- Man in his lifetime, uses energy in one form or the other. In fact whatever happens in nature, results, out of the conversion of energy in one form or the other? The blowing of the wind, the formation of the clouds and the flow of water are a few examples that stand testimony to this fact. The extensive usage of energy has resulted in an energy crisis, and there is a need to develop methods of optimal utilization, which will not only ease the crisis but also preserve the environment.
Energy conservation is the cheapest new source of energy. This paper attempts to show how energy can be tapped and used at a commonly used system, the road power generation. Road Power Generation (RPG) is one of the most recent power generation concepts. This device converts the kinetic energy of the vehicles into electric energy by installing moving plate on the road, it takes the stroke motion of the vehicles and converts it to the rotary motion by crank mechanism and it generates the electricity.
This paper also explains clearly, the working principle of the designed system, its practical implementation, and its advantages. Design of each component has been carried out using standard procedures, and the components have been fabricated and assembled. A similar model of the system has been modeled using Pro-E. Practical testing of the system has been done with different loads at different speeds. Taking the various criteria that determine the power generation, graphs have been plotted. 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.

Keywords: crank mechanism, power generation, speed breaker, street light, wasted energy.

I. INTRODUCTION

The automotive industry in India is one of the largest in the world and one of the fastest growing globally. India's passenger car and commercial vehicle manufacturing industry is the seventh largest in the world, with an annual production of more than 3.7 million units in 2010[1].We every day mesh up with these vehicles give us headache. But this mesh up could be answer of new type power generation.
Road Power Generation (RGP) is one of the most recent power generation concepts. This device is engineered as a practical and useful alternative energy technology for generating clean electricity from the millions of vehicles on our roadways [2]. Once fully optimized and installed, engineers anticipate that devices may be used to augment or replace conventional electrical supplies for powering roadway signs, street and building lights, storage systems for back-up and emergency power, and other electronics appliances, and even devices used in homes and businesses.

This device converts the kinetic energy of the vehicles into electric energy. This is done by moving plate installed on the road, this plate take the stroke motion of the vehicles and convert it to the rotary motion by crank mechanism and it generates the electricity [3].

II. 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 per year, whereas the consumption in India is 1200 KWh. One might conclude that to be materially rich and prosperous, a human being needs to consume more and more energy [4].
A 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 [5-6].

III. METHODOLOGY

3.1 Approach

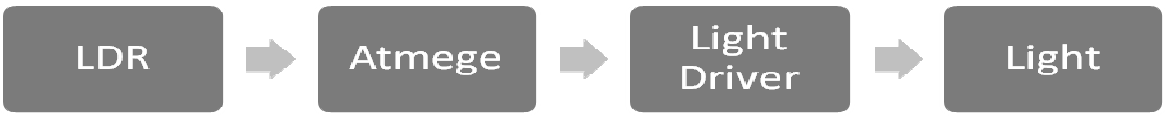
In this section, it was tried to understand the working principle of the RPG designed system its practical implementation, and its advantages.

3.2 Materials

In this section, there are several basic materials required to generate electricity by the road speed breakers The main equipments were used as i.e., Freewheel, Bicycle Rim, Helical spring, Pulley, Wooden frame, LDR, Microcontroller, L293D.

3.3 Working Principle

Road power generation (RPG) is a system design to capture waste and kinetic energy from all vehicles. This device converts the kinetic energy of the vehicles into electric energy. This is done by moving plate installed on the road, this plate captured very small movement from the road surfaces and it transferred to a keyway flywheel system. From hundreds of wheel lies a single flywheel having used to driving machinery. The RPG included the method of driving one flywheel to another, once it reached predetermining velocity. The RPG flywheel system has been developed to achieve large amount of moment of inertia in relatively small space. The captured energy is converted into electricity which is fed into power grid. With the following block diagram we can easily understand the overall working of the automatic street light.



The sensor LDR has the property to change its resistance according to the intensity of the light. As the intensity of light falling at the LDR increases, its resistance gets decreased and so on. Hence the total amount of light remains constant.

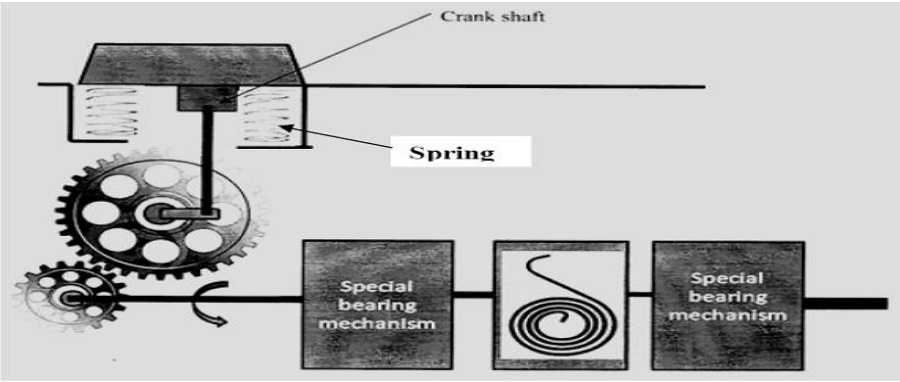


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Figure 1: Schematic diagram for the road power generation

3.4 Features

(i) The units have minimum visual impact on their surrounding environment.
(ii) The RPG emits no noise.
(iii) The unit will have minimum cost of installation and maintenance.
(iv) This unit could be located at the close proximity to services and power grid.
(v) Possible answer for battery charging station.
(vi) Completely isolated street light or traffic lights.

IV. RESULTS & DISCUSSIONS

4.1 Output Power Calculations

Let us consider,
The mass of a vehicle moving over the speed breaker =300Kg (Approximately)
Height of speed brake =10 cm
Work done=Force x Distance
Here, Force=Weight of the Body =300 Kg x 9.81 =2943 N
Distance traveled by the body = Height of the speed brake =10 cm
Output power=Work done/Sec = (2943 x 0.10)/60 =4.905 Watts (For One pushing force)
Power developed for 1 vehicle passing over the speed breaker arrangement for one minute = 4.905 watts
Power developed for 60 minutes (1 hr) =294.3 Watts
Power developed for 24 hours=7063.2 KW
This power is sufficient to burn four street lights in the roads in the night time.

4.2 Experimental Investigation

The experimental investigation is performed by placing the speed breaker arrangement in a pit. 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

Total load = 360 Kg (Vehicle load + man weight)

Table 1: Summary of Voltage generated versus speed of vehicles

Sr. No.	Speed of vehicles (Km/hr)	Voltage generated (volts)
1.	10	8.93
2.	20	7.32
3.	30	6.05
4.	40	5.65
5.	50	4.04

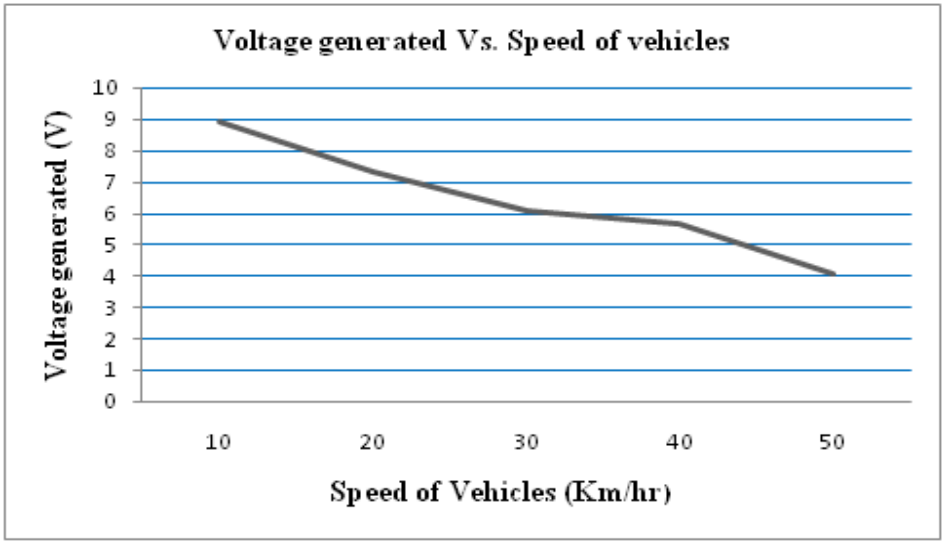

Figure 2: The graph between voltage generated & under different speed of vehicles

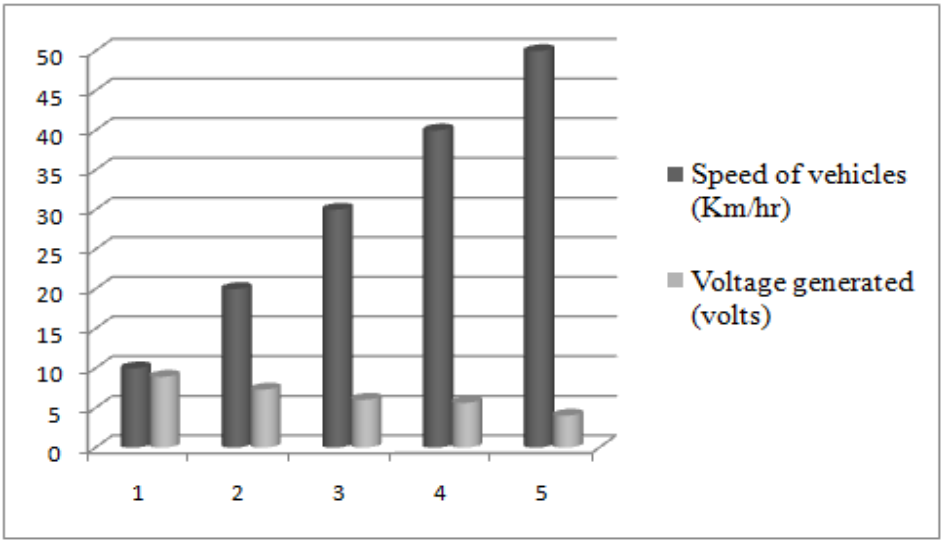

Figure 3: The bar chart between voltage generated & under different speed of vehicles

From the figure 2, it was seen that the sped of vehicles increases then voltage generated for designed system decreased. Figure 3 was also showing the bar chart between voltage generated & under different speed of vehicles.

Table 2: Summary of voltage generated & load of mans and vehicles for the RPG

Sr. No.	Load of man & vehicle (kgs)	Voltage generated (V)
1.	360	8.33
2.	430	9.57
3.	470	10.44
4.	500	11.34
5.	570	11.81

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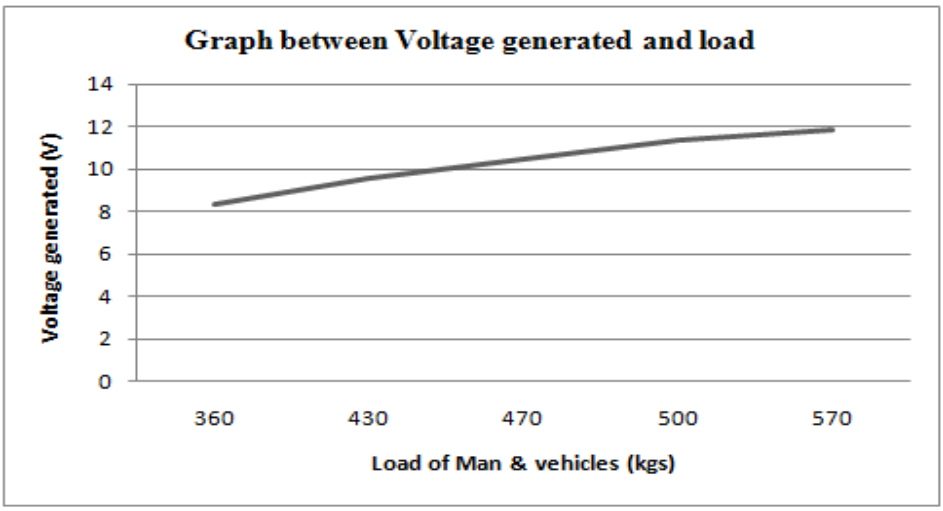

Figure 4: The graph between voltage generated & load of man and vehicles

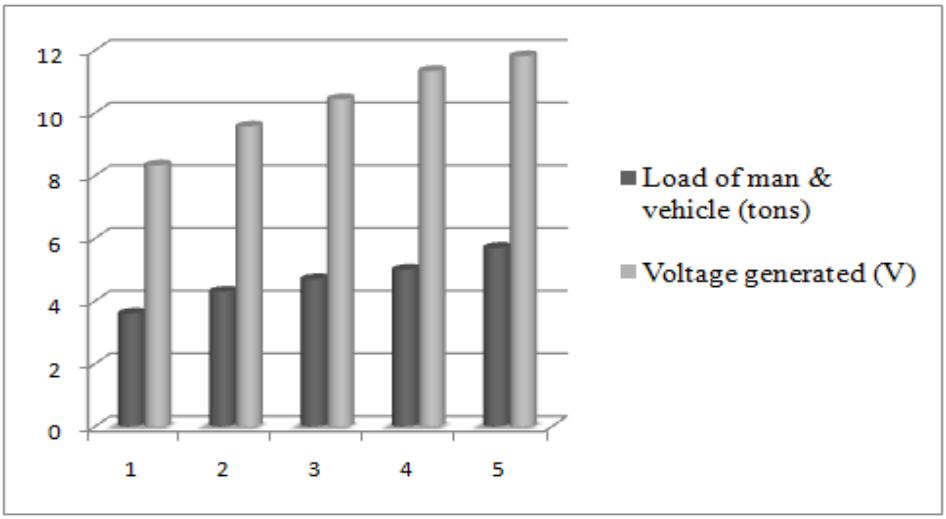

Figure 5: The bar chart between voltage generated & load of man and vehicles

From the figure 4, it was seen that the load of man & vehicles increases then voltage generated for designed system increased. Figure 5 was also showing the bar chart between voltage generated & load of mans & vehicles.

V. CONCLUSIONS & FUTURE STUDY

Road Power Generation is new type of unconventional source of energy. This is a type of vibration harvesting. This used waste energy of vehicles and converts kinetic energy to electric energy.

RPG possible answer for battery charging station and it may be possible the electric vehicle can be recharge with green power and power coming from electric vehicles earned wasted kinetic energy. The higher frequency of passing vehicles provides higher capacity of electricity generated by road power generation.

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