International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 04 Issue: 05 | May -2017 www.irjet.net p-ISSN: 2395-0072

Analyzing the effect of power generation using a nonconventional technique using a basic mechanical approach

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Abstract – *In global scenario the energy crisis is increasing as they may be referred to as an oil crisis, petroleum crisis, energy shortage, electricity shortage, electricity crisis. So an alternative energy source is required inorder to attain an sustainable development in universe. Among them we need to shortlize the demand and source. And need to identify a source, which is cheap, no natural input source is required to generate electricity. This paper is about generation of electricity using speed breakers. In this paper a mechanism is proposed for generating power by converting the potential energy generated by a vehicle going up on a speed breaker into electricity. When the vehicle moves over the angular plate, it gains height resulting hike in potential energy, which is wasted in a conventional speed breaker. When the breaker moves down, the rack and pinion mechanism (translator to rotary motion converter) is flexible. This in turn rotates a fly wheel at the middle of shaft which rotates a gear at the end of the shaft and then rotation transfer to gear train (rpm increased). The major output of this gear train is coupled with a generator to convert rotational energy into consumable electricity. A vehicle weighing 1,000 kg going up a height of 10 cm on such speed breaker produces approximately 0.98 kilowatt power. So one such speed-breaker on a busy highway, where about 100 vehicles pass every minute, about one kilowatt of electricity can be produced every single minute.*

Key Words: **Electricity, Speed breakers, Potential Energy, Mechanical Energy, Electrical Energy**

1. INTRODUCTION

The number of vehicles on road is increasing rapidly in day to day scenario and if we convert some of the potential energy of these vehicle into the rotational motion of generator then we can produce considerable amount of electricity. At present we are facing shortage of electricity. Electricity can be generated using dynamic movement of vehicles and mainly during the passage of speed breakers. The benefits from this idea will be to generate electricity for the streetlights, hoardings and then for other use. The vehicle at motion produces various forms of energy it can be transformed into useful source. Rough surface heat energy is produced, also when vehicle traveling at high speed strikes the wind then also heat energy is produced which is always lost in environment and of which we can't make use of….or directly we can say that all this energy that we can't make use of is just the wastage of energy that is abundantly available around us. In this paper we are just trying to make use of such energy in order to generate an "electrical energy". This paper will work on the principle of "potential energy to electrical energy conversion" potential energy can be thought of as energy stored within a physical system.

1.1 Current Scenario of electricity demand

The present demand of electricity is 12,850 MW, to satisfy the demand we are generating hydro power production is 2820 MW , thermal resources produce 1800 MW; the entire power production through independent power producers (IIPs) is 5030 MW, which accounts an total production of 9630 MW. The total current shortfall despite the fact that changing weather has decreased the demand of electricity, has reached 3250 MW, claimed National Transmission and Dispatch Company (NTDC) authorities. Since this mechanism is convenient to produce ample amount of energy with maximum efficiency, we have designed a very simple and effective design for generating electricity using a rack and pinion mechanism. Roberto _Alvarez Fern_andez[1] proposed a new approach by utilizing the hydrogen as a fuel. This leads to be a development of an alternative source. Zhiwei Ma[2] proposed a mathematical model for power generation using scroll expander. He demonstrated with a dynamic model. Jan Beier proposed that electric vehicles power can be stored during the running of vehicles. Rubenka Bandyopadhyay[3] (2015) discussed two methods of decarbonisation of electric system. Anish Modi[4] (2016) proposed a review on solar power generation.

1.2 Need of Speed Breaker on Indian road conditions

To Control the traffic signal and mainly in eliminating the congestion of traffic during peak hours. In present scenario comparing the other countries 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 effective utilization of energy is an indication of the growth of a nation. The energy consumption in USA is 9000 KWh (Kilo Watt hour) per year, whereas the consumption in India is 1200 KWh (Kilo Watt hour) but really we meeting our

demands is a huge problem. One might conclude that to be materially rich and prosperous, a human being needs to consume more and more energy for their basic demands. A recent survey on the energy consumption in India had published a pathetic report that many villages in India do not still have electricity. Supply of power in most part of the country an huge issue. Lot of small scale industries have shut down due to this problem. Hence more research and development and commercialization of technologies are needed at least to meet our basic demands. Unlike the top developed countries India roadways are not smooth. Talking about a particular road itself includes a number of speed breakers to control the human being rule breaking. So if we able to generate power with this conditions it really fruitful. The power generation can at least supply 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 village in India. This leads us into a sustainable development in universe.

2. Selection of raw material for generating mechanism

This paper explains the power generation through dynamic movement of vehicle. The diaphragm is connected at the base like MEMS arrangement. When the vehicle passes the speed breaker due to the movement the diaphragm bends. Due to its change in motion the diaphragm is connected to a two sprockets. Both sprockets are different shapes and sizes. One of the sprocket is larger and another one is smaller in size. The larger transfers the power to the smaller one. The smaller sprocket axis is aligned with the gear arrangement. Ideally the gears arrangement for creating power supply is also larger and smaller gears. The smaller sprocket is connected with the larger gear. The power is transmitted from larger gear to smaller gear. For every rotation of larger gear the smaller gear rotates 10 times as per the design proposed. So the potential energy converted into mechanical. The mechanical energy is converted into electrical energy through electrical principles. Our main work focusing on mechanism

Table -1: Designing of Gears

Speed Ratio:	T2/T1 = 22/22	N1/N2 = 1

Where, N1 = speed of the gear

N2 = speed of the pinion

T1 = number of teeth in gear

T2 = number of teeth in pinion

N2 = N1/1

If the speed of the gear N1 is 20 RPM then, the speed of the pinion N2 = 20 / 1=20 RPM

The model or prototype have been developed and fabricated and our main focus is potential energy converted into mechanical energy.

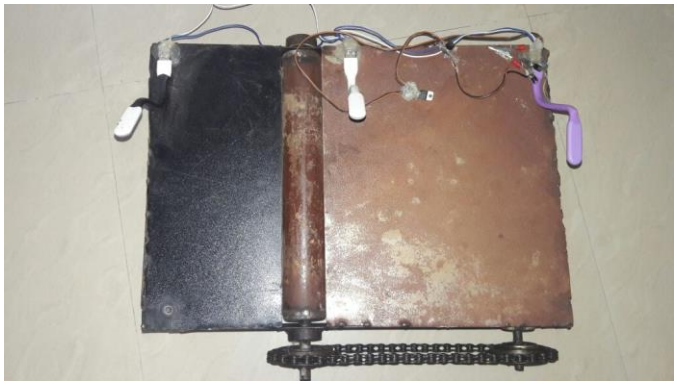

Fig -1: Plan view of proposed model

Fig -2: Elevation view of proposed model

3. Discussions and Review

Energy is an important part incorporating an industrial production rate with the hike in development of any Country. The conventional energy sources are depleting day by day. So each and every sources need to be effectively utilized. Here we have demonstrated an new idea by including the MEMS diaphragm movement into mechanism driver. This leads speed breakers as an power generating source.

The mass of a vehicle = 150Kg

Height of speed brake =10 cm

Work done=Force x Distance

where, Force = Weight of the Body = 150 x 9.81m/s = 1471.5 N

Distance travelled by the body = Height of the speed brake =10 cm

Output power= (1471.5 x 0.1)/60 = 2.452 Watts (For One ROTATIONforce)

Power developed for 1 vehicle passing over the speed breaker arrangement for one minute = 2.452 watts

Power developed for one hour =147.12 watts

Power developed for one day = 3.531 kw

Power developed for one month = 105.9 kw

Power developed for one year = 1271.16 kw

Experimental values are discussed as follows

Generated output voltage in one ROTATION force of speed breaker = 6.8v

Current in the circuit in one ROTATION force of speed breaker = 0.30 amps

As per ohm's law

Power developed for one push= V*I = 6.8 *0.31

p= 2.1 w

Power developed for one hour = 60 * 2.41 = 144.6 watts

Power developed for one day = 24 * 146.4 = 3.47 kw

Power developed for one month = 30 * 3513.1 = 104.118 kw

Power developed for one year = 12 * 105.408 = 1249.3 kw

3. CONCLUSIONS

For 100 bikes in a day Power generated = 2.1 * 100 = 210.1 watts. We can store the electricity produce from speed breaker in battery and then we can use it according to desire. As per the design proposed the present generation value itself a great success

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