

Power Generation by Using Speed Breaker

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Main purpose of this paper is generation of power by speed breakers. It is for replacing common speed breakers with some technical mechanism. In this world, population is increasing rapidly and the sources of energy are lessening. To solve the problem, our paper concerns with the reuse of wasted energy which is produced by the vehicles passing over the speed breakers. The vehicles spin the rollers connected to generator which generates electricity. As the number of vehicles is increasing at fast rate, this process will be a striking path to produce electricity. It can be easily used in any place. By this mechanism, the energy which is saved in day can easily be used in night. On the other hand the cost of fabrication material is very low.

Keywords: Non-conventional energy source, speed breaker, power generator, chain sprocket, roller mechanism, electromotive force.

1. Introduction

In paper, every member wants to show the technique of tapping energy and use at speed breakers. A large amount of energy is continuously wasted at speed breakers in the form of heating and friction. There is a great possibility to reuse kinetic energy of vehicles to produce power. This can be used for street lamps.

We first feel interest to do work in this sector by the study of the research paper of Priyadarshini. In that paper, we came to know that there is so much energy crisis. This is the main reason for more research are necessary in this field. Alok and Deepak (2013) presented the paper named Generation of Electricity through Speed Breaker. Aniket et al (2012) presented 'Electricity Generation from Speed Breakers. Aswathaman and Priyadarshini (2011) presented 'Every Speed Breaker Is Now A Source of Power'. Shakun and Ankit (2011) presented "Every Speed Breaker Is Now A Source of Power". Noor and Mustafa (2013) presented 'Production of electricity by the method of road power generation'. We came to know that the material they used is so much costly. But in our research, we always try to keep the cost issue in our mind. Our proposed model is not costly and on the other hand no man power is necessary in this easiest technology.

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In this paper section 1 deals with 'Introduction', section 2 deals with 'Literature Review', section 3 deals with 'Materials & method'. Also section 4 deals with 'Result & Discussion', section 5 & section 6 deals with 'conclusion & acknowledgement'.

2. Literature Review

The crisis of energy is one of the major problems that most of the developed and developing countries along with Bangladesh is facing. The study is to solve energy crisis and make the idea of generating power using speed breaker. Bangladesh is one of the most populated countries in the third world. Only a small part of area is electrified covering around 18% of total population. The people living in that area are suffering from load shedding. The electrical crisis of Bangladeshi people makes them to use this technique to lightening villages. The rule of basic physics is followed to convert the kinetic energy into electrical energy. Our working team caught the idea and we have finally decided to make a project that will produce power and develop the economy of our country.

IIT Guwahati has evaluated the machine and recommended it to the Assam ministry of power for large scale funding. IIT design department says it is a "very viable proposition" to harness thousands of mega watts of electricity untapped across the country every day. The Burger King on U.S. Highway, Customers pull in and out all day, and at least 100,000 cars visit the drive-thru each year. And a newly installed, mechanized speed bump will both help them slow down and harvest some of that coasting energy. The weight of a car is used to throw a lever, explains Gerard Lynch, the engineer behind the Motion Power system developed for New Energy Technologies, a Maryland-based company. "The instantaneous power is 2,000 watts at five miles-per-hour, but its instantaneous what means some form of storage will be required.

3. Materials and Methods

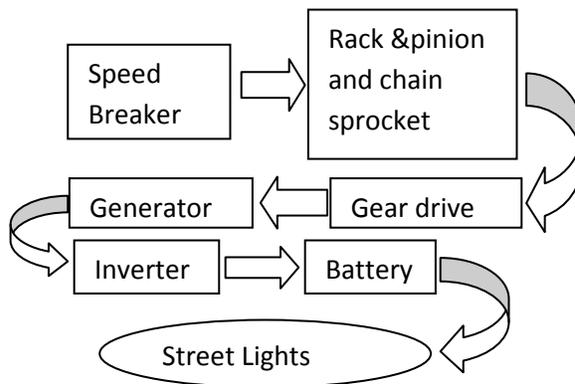
3.1. Equipment Required

1. Rack & Pinion Gears: This gear is used for converting translator motion. Rack and pinion can also convert rotary to linear from linear to rotary motion.
2. Ball Bearing: A roller element bearing carries a load between the two pieces. Relative motion of the pieces causes round elements to roll.
3. Spur Gear: A positive power transmission device having definite velocity ratio.
4. Flywheel: Flywheel is generally acts as an energy accumulator. It also absorbs the energy when it is required and releases the same.
5. Shaft: Shaft is a rotating element and is used to transmit power. It also supports other rotating elements like gears and flywheels.
6. Generator: It is known that generator is a device which changes the form of mechanical energy into electrical energy.

3.2. Working Procedure

This project is concerned with the explanation of the mechanism of power generation from speed breakers. The load of vehicle is transmitted to rack and pinion. After that, reciprocated motion is converted into rotary motion by the arrangements. Here, the pinion axis is connected with the sprocket arrangement. The arrangement has two sprockets. Dimensionally, one of the sprockets is comparatively larger than other. A chain connects both of the sprockets which transmits the power from the large sprocket to the small sprocket. For this, the speed of the large sprocket is multiplied with the rotary of the small sprocket. The small sprocket's axis is paired with a gear arrangement. Two gears having different dimensions are used here. The gear wheel having the large diameter is connected with the axis of the small sprocket. Since, the increasing speed of the small sprocket wheel is passed over gear wheel of large diameter. The small gear is connected to the large gear. When the large gear is rotated, it increases the amount of speed of the small gear and multiplies with speed to get more intensity. Then, the Final speed is so much high. This speed is comparatively enough to rotate the rotor and also sufficient to fed rotor. The rotor rotating within magnetic stator removes the magnetic flux. Then it produces the electromotive force. Then this generated emf goes to an inverter, where the emf is regulated. Finally, this emf is now sent to the battery and can use at night for producing power to street lights.

3.3. Block Diagram



3.4. Experimental Modeling

The experiment model has been modeled in three dimensions by the use of AutoCAD software. The supporting pieces of plywood are with dimensions of 92×885mm. In figure 1 we show the ramp and the base completely. The length of each shaft is 80mm and the thickness of each shaft is 4mm. The rollers are connected to each other via chains.

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Figure 1: Top view

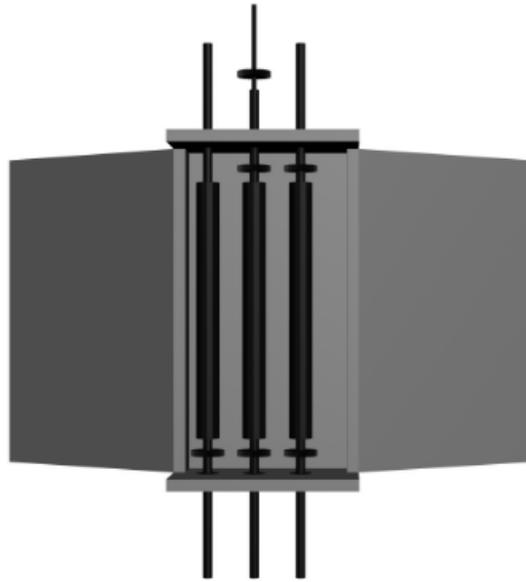


Figure 2: Side View

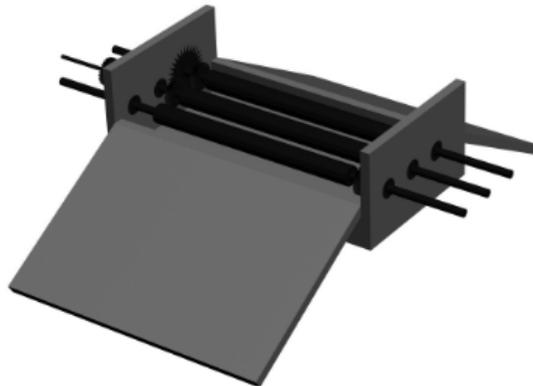
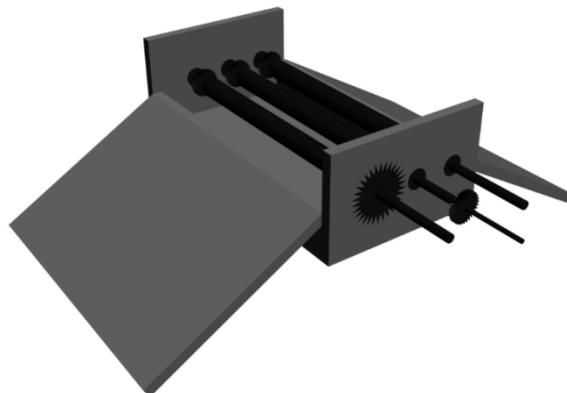


Figure 3: Full Model



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The ending part of rollers has CI sprockets having 40 teeth. The distance between two rollers is taken as the standard form of chain which is available at market.

3.5. Power Calculation

Let,

The mass of vehicle = 500kg (approximately)

Height = 20 cm

Work done = weight \times distance

Here, weight = 500 kg \times 9.81 = 4900 N

Distance = Height = 20 cm

Power = work done/second

$$= (4900 \times 0.20) / 60 = 16.33 \text{ watts}$$

This is the output power developed per vehicle passing over the speed breaker arrangement for one minute = 16.33 watts

Power developed for one hour = 979.8 watts

Power developed for a day = 23.51 KW

This power generated by vehicles is more than sufficient to run six street lights in the night time.

3.6. Cost of Fabrication Materials

The cost of fabrication is very low. For this reason this project is comparatively so much effective in Bangladesh. As, our country is not economically stable, the technique of generating power within such a low cost will be very suitable. Here, is a chart having current price of materials in market.

Table 1: Price of Fabrication Materials in Market

Material	Price (BDT-TK)
Rack & Pinion/piece	70.00tk
Spur Gear/piece	194.50tk
Flywheel/piece	330.00tk
Ball bearing/piece	345.00tk
Inverter/piece	23.90tk
9v battery/piece	45.15tk

4. Result and Discussion

For test, a two wheeler vehicle was run over the arrangement at different speeds to get the amount of current and voltage under different situations. Table I shows the results of the experiment. It is found that moving vehicle over the roller, the speed of that varies from 10-30 km/hour, the voltage produced is in the range of 3-4 volts.

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Figure 4: Generation of Power by Two Wheeler Vehicle

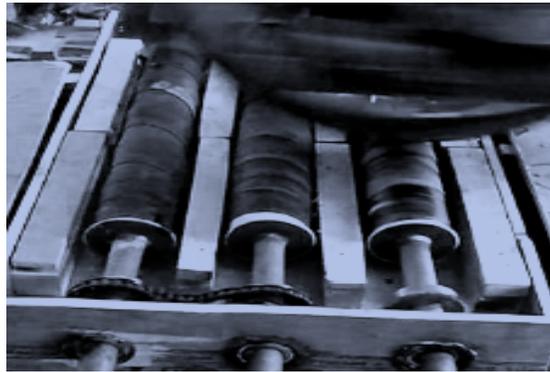


Table 2: Amount of Current and Voltage under Different Situations

Voltage	Current
3.4v	25.5mA
2.8v	21mA
2.5v	20mA

For single run of two wheelers having 0.08 W/tire of power is produced. According to statistical report of Bangladesh Road Permit Authority (BRTA), vehicular flow of 3153 pcu/h (passengers carrying unit per hour) for peak hours (8 hours windows), it is clear that large amounts of energy can be harnessed for 4/6 wheelers on highways employing similar setups.

5. Conclusion

In this project we discover a technology to generate electricity from speed breakers which is reliable and obviously will help to save our natural resources. Since, it saves a lot of electricity of power plants. Due to over population, the power generation has become insufficient to fulfill our requirements. This project can help to solve energy crisis very easily. The test should be done on a busy road intersection such as Dhaka-Aricha Road, Munshigong junction.

The reason why this model was used more than all of the other features are because other models would not have as much effect on the complete system. By changing the size and desirable price, weight and capacity can be realized. We used a survey to find out how the price, weight and capacity were scaled. Much was learned on how to and not to conduct a survey.

This concept is so important & here the reason behind this:

- Power generation with low cost.
- Environment friendly power generation.
- Comparatively less floor area required.
- Man power is not necessary.

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The significances of it are many. Some of them are indicated here:

- More durable plumber bearings can be used for replacing bearings for reducing the chance of failure.
- The rollers materials can be made lighter to increase efficiency.
- To reduce the shocks and vibration, V-belt drive can be used instead of chain drive.
- To provide better grip between the tires and the rollers, rollers with plain rubber can be replaced by a material with coarse texture.
- Mild steel which is used in this model can be replaced by aluminum allow.

There are a few limitations of this research. Here are:

- This process of power generation can be affected in rainy season.
- Without implementation in busy road, this process of power generation is nothing at all.
- Automation process should be implied in it.

Acknowledgement

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