

Electric Power Harvesting Using Speed Breaker Mechanism

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Abstract: India is a developing country, India has been experiencing a second energy/power during the pandemic. Demands for various facilities and resources will rise as the population grows, and this trend won't cease with this generation. In this project, we are working on a model that will convert the mechanical energy of a moving vehicle into electrical energy.

According to the law of thermodynamics, "energy cannot be generated or destroyed, but it can shift from one form to another." Every living or non-living body has some kind of stored potential energy same as in the case of a vehicle, the vehicle has some kind of potential energy. When the vehicle moves the potential energy gets converted into kinetic energy when a vehicle passes over a speed breaker, the speed breaker will get pushed in a downward direction and it will start the initial process of mechanism i.e. vertically attached piston rod will perform up and down motion also spring is attached with it, this rod will rotate along Y-axis and due to which other half curve rod attached perpendicular to the piston rod will get rotate along X-axis. Further, the rod is attached to a gearbox which converts low rpm input to high rpm output. A DC motor is attached at the end of the mechanism which converts mechanical energy into electrical energy. In this way, this mechanism will create energy.

Key Words: Electric power generation system, alternative energy method, speed breaker mechanism etc

I. INTRODUCTION

The utilization of energy is an indication of the growth of the Nation [1]. As compared to the other countries India comes under the developed country that represents the after some time this growth will going to affect some parameters due to low availability. There is a survey on energy consumption in India published a pathetic report that 85,000 villages in India do not still have electricity, supply of power in the most country is poor [2]. Power has now overtaken food as humanity's primary requirement. Energy is one of the important inputs in all the sectors and fields of the world. The availability of regular conventional fossil fuels is the main source of power production, but there is a fear that they will get exhausted eventually in the next few decades [3]. There is a need to consider non-conventional energy resources due to the world's population growth and the decline of conventional energy sources [4]. Another major problem, which is becoming the existing topic for today is pollution. Power stations like thermal power plants and automobiles are the major pollution-creating places. Therefore, a non-traditional power source is required to lessen this issue [5]. We proposed a non-conventional power gathering system based on a speed breaker mechanism that generates electric power without using any commercial fossil fuels, which is eco-friendly and it will not produce any pollution in the environment. This system will produce electricity without harming any living organisms of this country also this method will help in the future as an innovation towards electric power generation [6].

II. LITERATURE REVIEW

1. Power Generation Using Speed Breakers: A New Approach

Dr. M.K. Bhaskar, Manish Purohit, Pankaj Sharma, Hansraj, Prinshu Gupta, Priyanka Chouhan.

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In this 1st paper, the authors have designed a mechanism that creates energy by using magnetic fields. Whenever an armature rotates between the magnetic fields of the south and north poles, an E.M.F is induced in it. So, for inducing the E.M.F. to rotate an armature coil they connected it to a long shaft. By rotating same E.M.F is induced, for this rotation kinetic energy of moving vehicles is taken in utilized. The power is generated in both directions; to convert this power into one way authors have used a special component called Zener diode which gives continuous supply. They have placed a generator which is connected to a voltage regulator to make the voltage constant, so the battery won't damage. To store the power they have added a battery after the generator. Further, they have connected a battery to an inverter which inverts the DC voltage to AC which taken is used to light the streetlights. This mechanism they housed under the dome, like a speed breaker, which is called HUMP. Thus by using POWER HUMP they have increased electrical output.

2. Production of Electricity by the Method of Road Power Generation

Noor Fatima and Jiyaul Mustafa.

International Journal of Advances in Electrical and Electronics Engineering

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In this 2nd paper, the authors have designed a mechanism that captures the waste and kinetic energy from all vehicles. They have installed a moving plate on the road which captured very small movement from the road surfaces and transferred to a keyway flywheel system. When hundreds of wheels lie over single is used to drive machinery. The Road power generation (RPG) included the method of driving one flywheel to another, once it reached predetermining velocity. They have developed a flywheel system that achieves a large amount of moment of inertia in relatively small space. Then captured energy is converted into electricity which

is fed into the power grid. They have used a sensor LDR which 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 decreases and total amount of light stays constant. In such a way authors have generated electricity.

3. Design and Fabrication of Power generation System using Speed Breaker

D.Venkata Rao, K.Prasada Rao, S.Chiranjeeva Rao and R.Umamaheswara Rao.

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In this 3rd paper, the authors have designed and fabricated a setup that works on a reciprocal motion of the speed-breaker which is then converted into rotary motion using the connecting rod and crankshaft arrangement. They coupled an axis of the crankshaft with the larger gear. They have arranged two gears from which one of larger size and the other of smaller size. Both the gears are connected are meshed directly which serves which transmits the power from the larger gear to the smaller pinion. When the power is transmitted from the larger gear to the smaller pinion, the speed from the larger gear is multiplied at the rotation of the smaller pinion. The smaller gear's axis is connected to a gear set. They used two gears with different diameters and a gear wheel with a larger dimension. A wheel has meshed to the axis of the smaller pinion. The smaller gear and the larger gear are connected. As a result, even if the smaller sprocket's speed is increased by the larger gear, the smaller gear that comes after the larger gear continues to intensify the speed multiplier. Hence, although the speed due to the rotary motion achieved at the larger gear 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 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 daytime. This current is then utilized in the nighttime for lighting purposes on either side of the road to a considerable distance.

A. Objectives:

- 1) To design smart breaker power generates mechanism.
- 2) To design flexible and economical electric power.
- 3) To produce electric power for running our appliances.

B. Methodology:

As a roller, the speed breaker is supported by bearings at both ends. The friction material is placed over or around the speed breaker. As a result, whenever a vehicle crosses over the speed breaker, the friction between the wheels and the speed breaker and the bearing support causes the roller speed breaker to produce circular motions. This means that the circular motions are caused by the speed bump itself [1]. By utilizing the transmission system, circular motions are conveyed to the generator. Since there is no requirement for mechanical energy conversion in this situation because the speed breaker itself generates circular motion, there are likely fewer energy losses than in other processes. As is customary, the transmission system and the type of friction material used to wrap around the speed bump determine the system's efficiency [2].

As is common knowledge, a crank shaft is used to change linear motion into a circular or rotational motion. This form of power production is good, but because it has so many moving parts, there will be a lot of heat and vibrations in the system. So, when choosing such systems, the system should be thoroughly constructed [3]. The piston and crank shaft mechanism can produce circular motions because the specific speed breaker can support the linear motion. These circular motions can be conveyed to the generator utilizing an effective transmission system as our primary goal is to produce electrical energy [4].

Pistons are used in vehicle engineering to transform heat energy into mechanical linear motion. Using the crank shaft mechanism, that mechanically linear motion is changed into a circular or rotary motion. The differential receives the rotating motions produced by the crank shaft through a power transmission system [5]. Here, the piston is pushed down or linear motion is produced utilizing kinetic energy rather than heat energy as part of the power generating process using the crank shaft mechanism. As a result of the kinetic energy exerted on the speed breaker by the passing vehicle, the speed breaker pushes down the piston each time it is crossed. Therefore, the piston causes the crank shaft to turn in just one direction [6]. As a result, the piston returns to its original position by repositioning the speed breaker. A spring that is attached to the vertical rod that supports the piston also aids in the piston's return to its original position. The crank shaft mechanism can produce circular motion in this manner. The transmission system is used to send circular motions to the generator [7].

When compared to the crank shaft mechanism, the hydraulic speed breaker system performed better. To generate linear motion, the speed breaker also has a spring supported by a piston rod. Additionally, pistons are installed beneath the speed breaker so that each time a car drives over it, the speed breaker pushes the pistons downward [8]. As a result of the horizontal rod being rotated by the piston, the gear box mechanism will begin to rotate. The gear box is connected to a DC motor, which transforms the mechanical energy into electrical energy. The gear box works from low input RPM to high output RPM and can produce RPM over 1:100 [9].

Name of the component	Specifications
1. Motor	<ol style="list-style-type: none"> 1. Voltage: 12 2. Type: D.C. generator 3. RPM: 1200 RPM

2. Gear	<ol style="list-style-type: none"> 1. Material: Mild steel 2. No. of teeth:56 (Big Gear) 3. No. of teeth:48(Small Gear) 4. Type: Spur Gear 5. No. of gear used: 2
3. Spring	<ol style="list-style-type: none"> 1. Load bearing capacity: 6-7 kg 2. Material: Mild steel 3. Total displacement: 2 inch
4. Bearing	<ol style="list-style-type: none"> 1. Type: Rolling contact bearing 2. Bearing no.: N40
5. Shaft	<ol style="list-style-type: none"> 1. Diameter: 8mm 2. Material: Mild steel 3. Length: 381 mm

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