

# POWER GENERATION BY USING SPEED BREAKERS

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*Abstract* : Man in his life time, uses energy in one form or the other. Now a days power plays a major role in our day to day life.Power helps a lot in the development of a country.At present most of the energy is developing by convetional energy resources. According to the increasing rate of population, the conventional energy resources cannot meet the requirement of people and moreover, these conventional energy resources are polluting the environment and responsible for Global warming. So non-conventional energy sources are developed to meet the requirements and to reduce the environmental pollution. In that sense some inventions are discovered based on speed breakers by taking those as reference we developed a mechanism by using chain and sprocket. This project developes power generation through speed breaker by making gear arrangement and using electronic gadgets. When vechile is in motion it produces various forms of energy like, friction between vehicels wheels and road i.e., rough surface HEAT ENERGY is produced. We can tap the energy generated by moving vehicles and produce power by using the power generation setup. In this process we convert the potential energy to mechanical energy through chain and sprocket mechanism and then this energy in converted into electrical energy using generator.The principle involved is Potential Energy to Electrical Energy Conversion. One might conclude that to be materially rich and prosperous, a human being needs to consume more and more enery. And this project is best source of energy that we get in day to day life.

Key words:Breaker,Energy,power

## I. INTRODUCTION

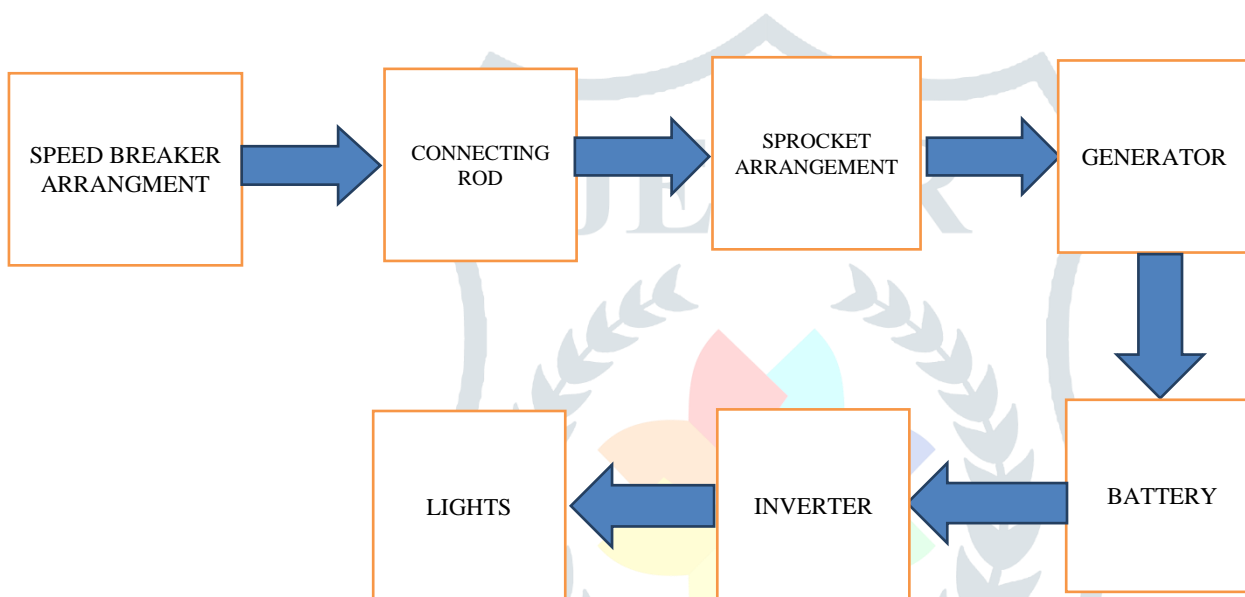
This project attempts to show how energy can be tapped and used at a commonly used system the road speed-breakers. The number of vehicles passing over the speed breaker in roads is increasing day by day. A large amount of energy is wasted at the speed breakers through the dissipation of heat and also through friction, every time a vehicle passes over it. There is a great possibility of tapping this energy and generating power by making the speed breaker as a power generation unit. The generated power can be used for the lamps, near the speed breakers. In this model we show that how can we generate a voltage from the speed breaker. Conversion of the mechanical energy is widely used concept. It's a mechanism to generate power by converting the potential energy generated by a vehicle going up on a speed breaker into rotational energy. We have used that simple concept to the project.The utilization of energy is an indication of the growth of a nation. For example, world average per capita electricity consumption 2664 KWH/person per year. Compared to India's per capita electricity consumption of **805.60 KW/H** as of 2014. India is the world's third largest producer and third largest consumer of electricity. The national electric grid in India has an installed capacity of **368.69 GW** as of **31 December 2019**.one might conclude that to be materially rich and prosperous, a human being needs to consume more and more energy. 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.

## WORKING PRINCIPLE:

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 connecting rod. Here the reciprocating motion of the speed-breaker is converted into rotary motion using the connecting rod. The axis of the connecting rod is coupled with the sprocket arrangement. The sprocket arrangement is made of two sprockets. One of larger size and the other of smaller size (free wheel). 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 fly wheel. The fly wheel is coupled to the shaft at axis of the smaller sprocket. Hence the speed that has been multiplied at the smaller sprocket wheel is passed on to this flywheel of larger dimension. The smaller sprocket is coupled to the larger fly wheel. So, as the larger fly wheel rotates at the multiplied speed of the smaller sprocket, the smaller sprocket following the larger sprocket 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 fly wheel, finally the speed is multiplied to a higher speed. This speed which is sufficient to rotate shaft connected to generator. The rotor (shaft) rotates the generator. The generator produces the DC current. This DC current 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.

### 3.2 BLOCK DIAGRAM:



**FIG 3.1 B**  
**LOCK DIAGRAM OF CONSTRUCTION**

### MODELING AND SIMULATION

#### 4.1 FABRICATION DETAILS:

The frame structure for the total unit is fabricated using L-Angle frames and ordinary frames. These frames are made of mild steel. They are held to proper dimensions are attached to form a unit with the help of welding. Then the bearings which are of standard make are kept in place with the irrespective shafts through them and are welded to the frame structure.

The shafts are also made of mild steel. Hinges are used to move the speed breaker arrangement by welding it to the frame structure. These hinges are responsible for the movement of the speed breaker in an up and down motion. A connecting rod which is made up of mild steel is welded to the speed breaker arrangement. The axis of the connecting rod is made exactly to mate with the axis of the sprocket.

A bicycle sprocket and chain arrangement of standard make is fitted with the larger sprocket on the top shaft and its smaller sprocket on the bottom shaft. The sprocket wheels are welded to the shafts. A fly wheel that is made of cast iron is machined suitably to the precise dimensions in a lathe and is placed on the shaft with its axis coinciding with the axis of the shaft and is welded. A special stand arrangement is made to seat the 24v DC generator using frames. A 24v DC generator is placed within the seat and is held firm using bolts and nuts.

#### FABRICATION MODEL SHOWING INNER PARTS:

Wires are connected to the terminals of the DC generator and its other ends are connected to a Lead-Acid battery. Another wire is taken from these points on the battery and its other ends are connected to the Positive and negative terminal of an inverter. An output wire from the inverter is sent to the light.

#### 4MATERIALS USED:

- RACK -MILD STEEL
- SPROCKET WHEELS -MILD STEEL
- CHAIN -MILD STEEL
- SPUR GEARS -CAST IRON

- SPRINGS -MILD STEEL
- SHAFT -MILD STEEL
- SPEED BREAKER -MILD STEEL

#### EQUIPMENT REQUIRED

**Shaft& Generator** It is a rotating element, which is used to transmit power from one place to another place. It supports the rotating elements like gears and flywheels. It must have high torsional rigidity and lateral rigidity.



fig:5.1 shaft

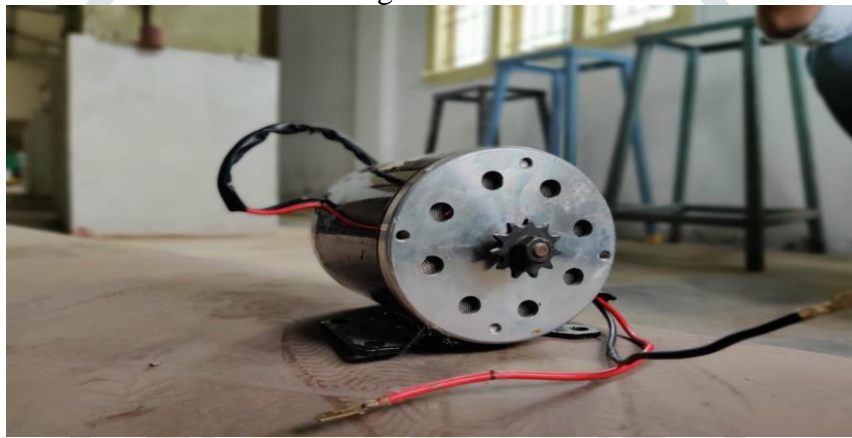


Fig:5.2 GENERATOR

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#### 5.3 Lead acid battery:

Lead-acid batteries are the most common in PV systems because their initial cost is lower and because they are readily available nearly everywhere in the world. There are many different sizes and designs of lead-acid batteries, but the most important designation is that they are deep cycle batteries. Lead-acid batteries are available in both wet-cell (requires maintenance) and sealed no-maintenance versions. AGM and Gel-cell deep-cycle batteries are also popular because they are maintenance free and they last a lot longer.

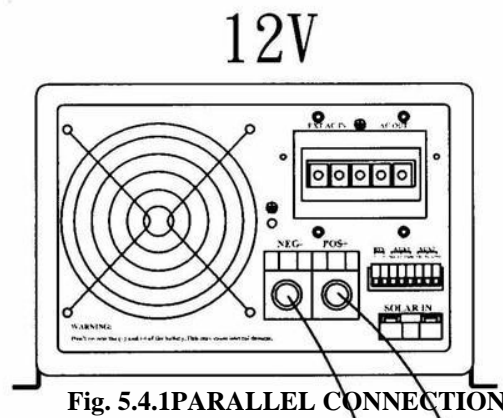
Lead acid batteries are reliable and cost effective with an exceptionally long life. The Lead acid batteries have high reliability because of their ability to withstand overcharge, over discharge vibration and shock. The use of special sealing techniques ensures that our batteries are leak proof and non-spill able. Other critical features include the ability to withstand relatively deeper discharge, faster recovery and more chances of survival if subjected to overcharge.

Lead acid batteries are manufactured/ tested using CAD (Computer Aided Design). These batteries are used in Inverter & UPS Systems and have the proven ability to perform under extreme conditions. The batteries have electrolyte volume, use PE Separators and are sealed in sturdy containers, which give them excellent protection against leakage and corrosion.

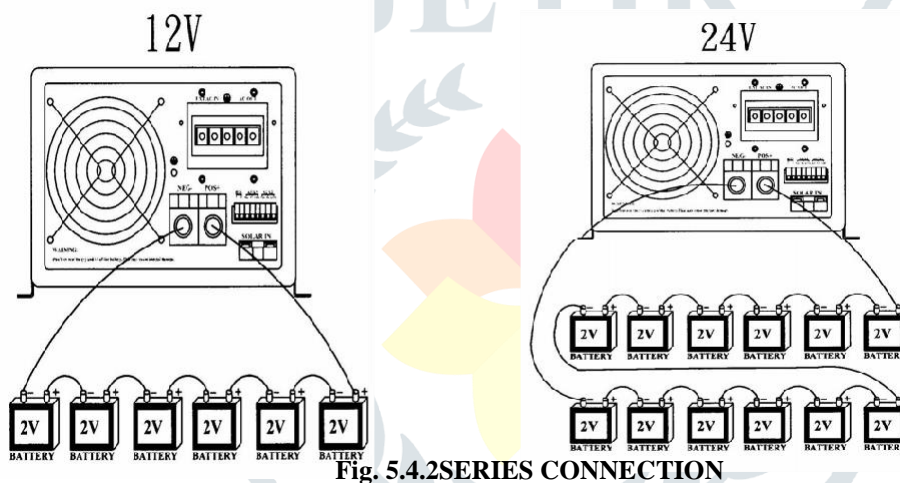
#### 5.4 Battery connections:

Lead-acid batteries are normally available in blocks of 2V, 6V or 12V. In most cases, to generate the necessary operating voltage and the capacity of the batteries for the Solar Inverter, many batteries have to be connected together in parallel and/or in series. Following three examples are shown:

a) Parallel Connection:



b) Series Connection:



5.5 Sprocket:

A sprocket or sprocket-wheel is a profiled wheel with teeth or cogs that mesh with a chain, tracker other perforated or indented material. The name "sprocket" applies generally to any wheel upon which are radial projections that engage a chain passing over it. It is distinguished from a gear in that sprockets are never meshed together directly, and differs from a pulley in that sprockets have teeth and pulleys are smooth. The word "sprockets" may also be used to refer to the teeth on the wheel.



Fig.5.5 SPROCKET

Sprockets are used in bicycles, motorcycles, cars, tracked vehicles, chainsaws and other machinery either to transmit rotary motion between two shafts where gears are unsuitable or to impart linear motion to a track, tape etc. Perhaps the most common form of sprocket may be found in the bicycle, in which the pedal shaft carries a large sprocket-wheel, which drives a chain, which, in turn, drives a small sprocket on the axle of the rear wheel. Early automobiles were also largely driven by sprocket and chain mechanism, a practice largely copied from bicycles. Sprockets are of various designs; a maximum of efficiency being claimed for each by its originator. Sprockets typically do not have a flange. Some sprockets used with timing belts have



flanges to keep the timing belt centered. Sprockets and chains are also used for power transmission from one shaft to another where slippage is not admissible, sprocket chains being used instead of belts or ropes and sprocket-wheels instead of pulleys. They can be run at high speed and some forms of chain are so constructed as to be noiseless even at high speed.

### DESIGN PARAMETERS, LIMITATIONS & ADVANTAGES AND DISADVANTAGES

#### 7.1 OUTPUT POWER CALCULATIONS:

Let us consider,

The mass of a vehicle moving over the speed breaker = 10 Kg (Approximately) Height of speed brake = 25 cm

Work done = Force x Distance Here,

Force = Weight of the Body = 10 Kg x 9.81 = 98.1 N

Distance travelled by the body = Height of the speed brake = 25 cm = 0.25 metres

Work done = 98.1 x 0.25 = 24.525 J

Output power = Work done/Sec = 24.525/60 = 0.4 Watts (For One pushing force)

Power developed for 1 vehicle passing over the speed breaker arrangement for one minute = 24 watts

Power developed for 60 minutes (1hr) = 1440 watts

Power developed for 24 hours = 34,560 watts

#### Velocity Ratio of Chain Drives:

The velocity ratio of a chain drive is given by

$N_1$  = Speed of rotation of smaller sprocket in r.p.m.,

$N_2$  = Speed of rotation of larger sprocket in r.p.m.,

$T_1$  = Number of teeth on the smaller sprocket, and

$T_2$  = Number of teeth on the larger sprocket.

#### 7.2 DESIGN SPECIFICATIONS:

SHAFT (DIA) = 65 mm

Diameter of flywheel = 540 mm

Thickness of flywheel = 20 mm

#### 7.3 SPROCKET WHEEL AND CHAIN:

No of teeth on large sprocket = 36

No of teeth on small sprocket = 19

Dia of large sprocket = 460 mm

Dia of small sprocket = 230 mm

Length of chain = 1620 mm

Optimum center distance = 560 mm

#### 7.4 SPRINGS SPUR GEARS:

##### i) SPRINGS:

Diameter of wire = 2 mm

Mean dia of coil = 12 mm

Free length of spring = 300 mm

##### ii) SPUR GEARS:

No of Teeth on Rack = 36

Rack Length = 230 mm

No of Teeth on Pinion = 36

Diameter of Pinion Gear = 260 mm

Thickness of pinion gear = 20 mm

Length of speed breaker = 290 mm

Width of speed breaker = 220 mm

Height of speed breaker = 130 mm

### CONCLUSION

"Electricity plays a very important role in our life". Due to population explosion, the current power generation has become insufficient to fulfill our requirements. In this project we discover technology to generate electricity from speed breakers in which the system used is reliable and this technique will help conserve our natural resources. In coming days, this will prove a great boon to the world, since it will save a lot of electricity of power plants that gets wasted in illuminating the street lights. As the conventional sources are depleting very fast, then it's time to think of alternatives. We got to save the power gained from the conventional sources for efficient use. Now, vehicular traffic in big cities is more, causing a problem to human being.

But this vehicular traffic can be utilized for power generation by means of new technique called “power hump”. It has advantage that it does not utilize any external source. This technology is still in the stage of development. In future it is used to generate the power throughout the year. Power generation is not affected by environmental conditions. It is pollution free technique for generation of electricity. Suitable at parking of multiplexes, malls, toll booths, signals, etc. Such speed breakers can be designed for heavy vehicles, thus increasing input torque and ultimately output of generator. More suitable and compact mechanisms to enhance efficiency.

#### **FUTURE SCOPE**

Heavy vehicles can generate high torque and hence the power generated from them will be quite high. More suitable and compact mechanisms to enhance efficiency could be created. As these systems are installed on open roads, water accumulates in heavy rainfall regions which may be a threat for working of this system. So, waterproof system can be developed to use this system in heavy rainfall regions also. Multiple generators could be connected so that power generated would be more.

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