International Journal of Engineering Research & Technology (IJERT)
ISSN: 2278-0181
Vol. 10 Issue 09, September-2021

Power Generation using Speed Breaker

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***Abstract*— The following article will give us an idea that how can we use speed breakers to generate power. These can be done by adding a rack and pinion type of gear with a generator attached to the combination of the gears mentioned above. The electricity can also be stored in various cells or other storage sections. The following paper also has a sample calculations for which the energy calculations are been done. These are some of the sample calculations with an average weight of a passenger car. All the basic components related to the topic are elaborated in the write-up. The further research on the same is in progress.**

Keywords*— Speed Breaker, Rack & Pinion Gear, Generator, Storage Cells/Battery, Passenger Car.

I. INTRODUCTION

Now-a-days electric energy is lot in each and every one's mind. Well it is now possible while you are driving your car or riding any kind of two wheeler. This can be done when we drive or ride over a speed breaker. Yes you read it right while riding or driving over a speed breaker. The conventional speed breakers are only used to reduce the speed of a vehicle which totally depends on the material with which the speed breakers are made. Sometimes these speed breakers are made of rubber, sometimes of concrete or sometimes mixture of concrete and pavements. This can be done by introducing some of simple mechanisms under the speed breakers.[1] One such simple mechanism is a rack and pinion gear while the other one is a small generator with some wiring. With the help of these small mechanisms here is how we can implement the power generation program from the speed breakers.

II. METHODOLOGY

The working principle of this power generation program is to convert the kinetic energy to electric energy via mechanical energy. This can be done when the brakes are applied upon the vehicle kinetic energy is produced. After this the kinetic energy is converted to mechanical energy using a rack and pinion gear and the by connecting the pinion gear to a generator shaft the energy is converted into electrical energy.

1. **Speed Breaker:-** This is a normally used thing in everyday life. This element can be made from the composite of carbon fibre and rubber so that the speed breaker can sustain the heavy load of vehicles such as a container filled with some material in it. The speed breakers can be made such that the starting and ending slopes would be made up of concrete and cement mixture and the central part would be made up of the composite mentioned before.

2. **Rack and Pinion Gear [2]:-** This is one of the simplest types of gears and can be manufactured according to one's own need. As the name suggests this type of gear has two components namely Rack which is a straight gear with tooth in only one direction, the second component is the Pinion which is a round shaped gear and will roll upon the rack to perform its task. The alignment of this gear will be in vertical direction.

3. **Generator: -** A generator is a device which converts mechanical energy into electrical energy. In this case the work of the generator remains the same and for that the shaft of the generator will have a pinion gear on its edge. The pinion gear will be meshed with the pinion gear of Rack and Pinion arrangement. As the first pinion gear will rotate the second gear will also rotate with the shaft of the generator. This will induce EMF (Electro Motive Force) in the generator and electricity will be produced.

4. **Electricity Storage: -** It is very difficult to store electricity for a long time into any kind of storage. To deal with this issue a battery pack will be introduced which will help us store the electric energy in to the battery pack. Also battery packs can be useful to transfer electric energy from one place to another.

III. ADVANTAGES

Here are some of the advantages of using this type of Power Generation program:-

- No consumption of any fossil fuel.
- No manual work necessary during generation.
- Eco-friendly.
- 24 hours applicable.
- Low installation cost.

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- Low maintenance cost.
- Simple in construction.
- Less space is required.
- Pollution free power generation.
- Energy available all year round.
- Maximum utilization of energy.

IV. APPLICATIONS

The Power generated can be used in many places like

- Street lights.
- Road signals.
- Sign boards on roads.
- Digital advertising boards on roads.
- Lighting of the check post on the highways.

V. CALCULATION

- Mass of a regular car = 1600kg (Avg.)
- Weight of car = Mass * Acceleration due to gravity = 1600kg * 9.8ms^{-2} = 15680N
- Height of Speed Breaker = 15cm
- Work done = Force * Displacement = Weight of car * Height of Speed Breaker = 15680N * 0.15m = 2352Nm
- Power = Work done / time = 2352Nm / 60s = 39.2W
- Power generated in a day = 39.2W * 24hr * 60 min = 56.45 KW

This Power generated by vehicles is more than sufficient to power street lights all night.

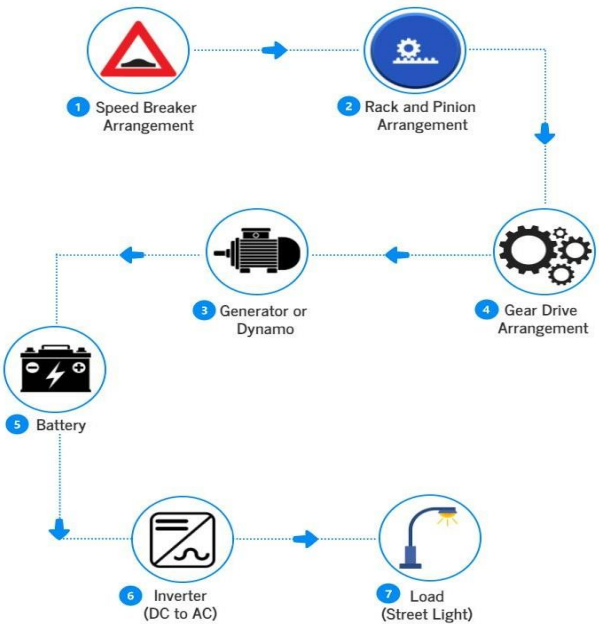
VI. CONCLUSION

Day by day the consumption of power is increasing and the need of electricity is rising. Hence to be able to control this need of electricity consumption and reduce the use of other fossil fuels this project can be implemented into everyday life.

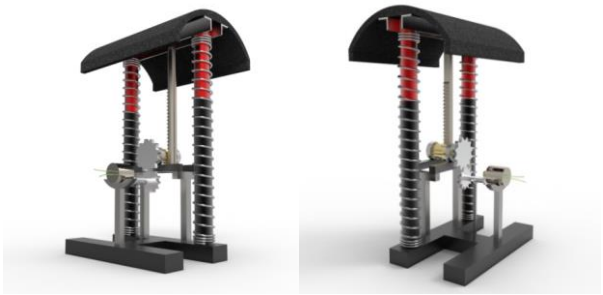
VII. FUTURE SCOPE

The future scope of this project is to improve the sustainability of the speed breakers that is by using various materials for the manufacturing of speed breakers. Improvement of power generation system by using other types of power generators can also be implemented.

VIII. BLOCK DIAGRAM



IX. RENDERED DESIGN



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