Electric Power Generation by Speed Breaker

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Abstract—Electricity is the form of energy which is most widely used in nature. Electric power obtains from conversion of other sources of energy like coal, natural gas, nuclear power etc. It is very significant to design pollution free energy generation system. The primary resources are conventional type and are in limited quantity and then not renewable and create pollution to the atmosphere.

Speed breaker power generation is the most emerging technique which produces electrical power with minimum input. On speed breaker tremendous amount of energy is being wasted by vehicle through friction every time when vehicle passes over it, so electricity can be generated using the vehicle speed and weight as input. This paper attempts to show the different method of renewable energy generation through speed breaker.

Index Terms- Power generation, speed breaker, rack and pinion mechanism.

I. INTRODUCTION

During last few years, electrical energy is the basic requirement of human beings. The ratio of electricity requirement is increasing day by day. But we know that the resources for power generation are limited, and this has caused the energy crisis. The increasing power demand results reduce in conventional resources for power generation and increase the pollutants emissions. It is a need of time to think about non-conventional energy resources or renewable energy resources which are eco-friendly to the environment. In order to minimize the emission of greenhouse gases, renewable energy technologies are widely used for electricity generation. Solar and wind technologies are frequently used for electricity generation. Fig 1 shows power generation in India by each sector.

The availability of regular conventional fossil fuels will be the main sources for power generation, but there is fear that they will get exhausted. Therefore, we have to investigate new sources for power generation. Another major problem today is pollution which has impact on all living organism, land air water.

Therefore, we have to investigate pollution free and renewable resources, which produce electricity without any commercial fossil fuel.

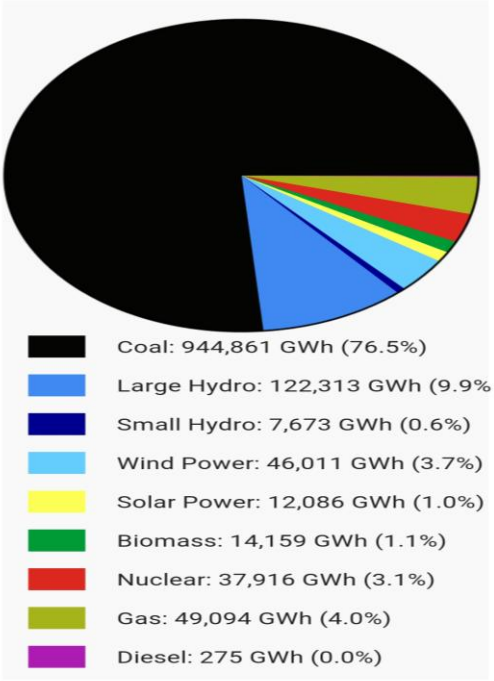

Fig1. Power generation in India

II. BASIC PRINCIPLE

While moving, the vehicles possess some kinetic energy and it is being wasted. This kinetic energy can be utilized to produce power by using a special arrangement called POWER HUMP. It is an Electro-Mechanical unit. It utilizes both mechanical technologies and electrical techniques for the power generation and its storage. POWER HUMP is a dome like device likely to be speed breaker. Whenever the vehicle is allowed to pass over the dome it gets pressed downwards then the springs are attached to the dome is compressed and the rack which is attached to the bottom of the dome moves downward in reciprocating motion.

Since the rack has teeth connected to gears, there exists conversion of reciprocating motion of rack into rotary motion of gears but the two gears rotate in opposite direction. A flywheel is mounted on the shaft whose function is to regulate the fluctuation in the energy and to make the energy uniform. So that the shafts will rotate with certain R.P.M. these shafts are connected through a belt drive to the dynamos, which converts the mechanical

energy into electrical energy. The conversion will be proportional to traffic density.

Types of Mechanisms

We can develop electricity from speed breakers by using 2 Mechanisms basically. They are as follows:

- Rack-pinion mechanism
- Roller mechanism

III. ROLLER MECHANISM

In this Mechanism, a roller is fitted in between a speed breaker and some kind of a grip is provided on the speed breaker so that when a vehicle passes over speed breaker it rotates the roller. This movement of roller is used to rotate the shaft of D.C. generator by the help of chain drive which is there to provide different speed ratios. As the shaft of D.C. generator rotates, it produces electricity. This electricity is stored in a battery. Then the output of the battery is used to lighten the street lamps on the road. Now during daytime, we don't need electricity for lightening the street lamps so we are using a control switch which is manually operated. The control switch is connected by wire to the output of the battery. The control switch has ON/OFF mechanism which allows the current to flow when needed.

In this project the ramps has been replaced with the specially designed rollers which directly absorbs the kinetic energy of the moving vehicles and converts them to rotational energy and thereby rotating the generator, to produce the electrical power.

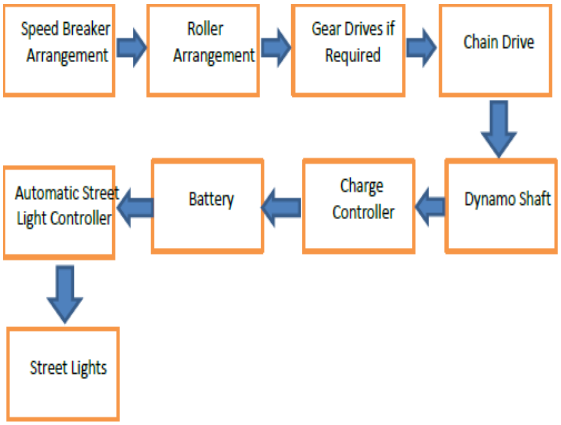

Fig2. Block diagram of setup

IV. DISADVANTAGES

- Maintenance will be very difficult
- Might cause collision

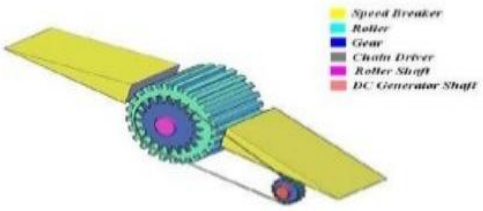

Fig3. Overall design layout

Table1: Vehicle load corresponding voltage and current

Load (Kg)	Voltage (Volts)	Current (Amps)
135	2.3	0.1
205	3.1	0.22
270	4.08	0.31
300	5.5	0.42
440	7.2	0.6
600	8.6	0.74

V. WORKING OF RACK-PINION MECHANISM

While moving, the vehicles possess some Potential Energy due to its weight and it is being wasted. This kinetic energy can be utilized to produce power by using a special arrangement called POWER HUMP. It is an Electro-Mechanical unit. It utilizes both mechanical technologies and electrical techniques for the power generation and its storage. POWER HUMP is a dome like device likely to be speed breaker.

Whenever the vehicle is allowed to pass over the dome it gets pressed downwards then the springs are attached to the dome and are compressed and the rack which is attached to the bottom of the dome moves downward in reciprocating motion of rack into rotary motion of gears but the two gears rotate in opposite direction. So that the shafts will rotate with certain R.P.M. these shafts are connected through a set of gears to the dynamos, which converts the mechanical energy into electrical energy.

The conversion will be proportional to traffic density. The electrical output can be improved by arranging these POWER HUMPS in series. This generated power can be amplified and stored by using different electrical devices. 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 rack and pinion arrangements. Here the reciprocating motion of the speed-breaker is converted into rotary motion using the rack and pinion arrangement. The axis of the pinion is coupled with a gear. This gear is meshed a pinion.

As the power is transmitted from the gear to the pinion, the speed that is available at the gear is relatively multiplied at the rotation of the pinion. The axis of the pinion is coupled to a gear arrangement. Here we have two gears with different diameters. The gear (larger

dimension) is coupled to the axis of the pinion. Hence the speed that has been multiplied at the smaller sprocket wheel is passed on to this gear of larger dimension. The pinion is meshed to the gear. So as the gear rotates at the multiplied speed of the pinion, the pinion following the gear still multiplies the speed to more intensity.

Hence although the speed due to the rotary motion achieved at the first gear is less, as the power is transmitted to gears the speed is multiplied to a higher speed. This speed is sufficient to rotate 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 a bridge rectifier, where the generated AC current is converted to DC. This regulated emf is now sent to the lead-acid battery.

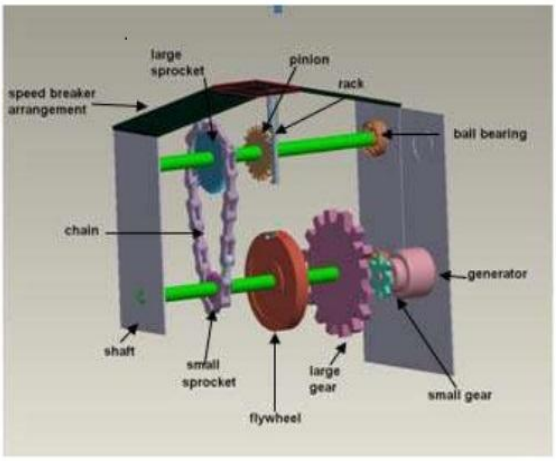

Fig4. Schematic diagram

A. Methodology

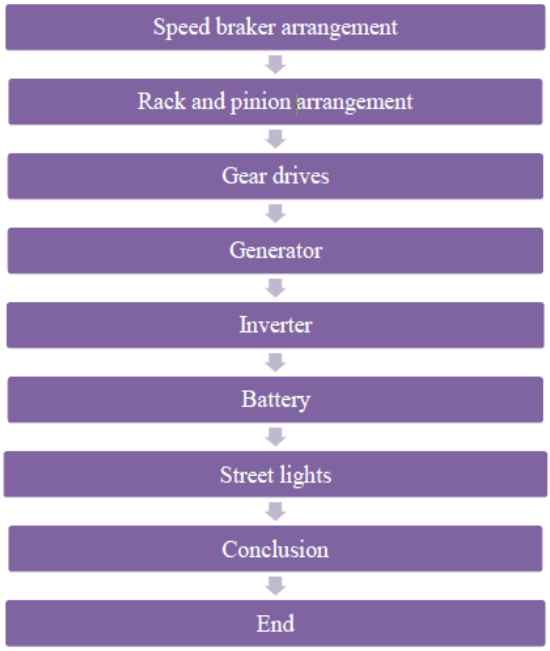

Fig .5 Flow chart

Table 2.Voltage generated and load of vehicle

Sr. no.	Load(kg) of vehicle	Voltage generated (volts)
1	360	8.33
2	430	9.57
3	470	10.44
4	500	11.34

VI. COMPARISON

Table 3.Comparison Of Parameters Of Different Speed Breaker Mechanism

Sr. No	Parameter	Roller mechanism	Rack & Pinion Mechanism
1	Cost	Cheap	Moderate
2	Mechanism Set up	Very less	Difficult
3	Maintenance	Less Required	Weekly Basis
4	Efficiency	50%	70%
5	Design	Easy to Design	Depends upon weight sustaining capacity

VII. ADVANTAGE OF USING SPEED BREAKER AS POWER GENERATOR

- Require simple construction methods.
- Installation is easier.
- Cost for maintenance is low.
- During generation no manual work is necessary.
- All year round energy is available.
- It is pollution free

CHALLENGES

- Selection of suitable generator
- We have check mechanism on regular interval of time
- It may get damage because of rain water
- Require more suitable and compact mechanism to enhance efficiency

VIII. CONCLUSION

In coming days, demand for electricity generation will be very high as it is need for everyone, speed breaker mechanism will prove great boom for future in electricity generation. Looking at the recent conditions of the

electricity crisis in India, government focuses on utilizing the non-conventional energy sources for electricity generation and reducing the share of global warming. So, the techniques described in the paper will also contribute to the power generation nationally with some more modifications in the model.

In this paper, we referred different mechanisms and every mechanism has its own advantages and disadvantages. Therefore as per our study we conclude that rack and pinion mechanism is efficient as well as cost effective mechanism for generation of electricity from speed breaker.

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