Power generation using speed breakers

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**Abstract**— In today’s life energy is badly needed to every human being. So in the present scenario due to day to day increase in the population and lessen of conventional sources energy crisis occur. So to solve the energy crisis problem we require more renewable sources of energy or unconventional source of energy. So my project is based upon unconventional sources of power generation. So to generate this kind of energy we should implement it. We know, while moving every vehicle produces some kinetic energy and that is being wasted. That kinetic energy can be utilized to produce power using some special set of arrangements called POWER HUMP. The kinetic energy of moving vehicle can be converted into mechanical energy of shaft by using rack and pinion. The shaft is connected to electric dynamo which produces electrical energy with proportional to the traffic density which acts as load. For continuously supply of this generated power can be regulated through zener diode. All the mechanisms can be constructed through some dome like structures called speed breakers or humps. The generated power can be utilized for some general purposes like street lights, traffic signals etc. The electric output can be improved by connecting these power humps in series. This can be amplified and stored by various electrical devices. The maintenance of this project almost nullified. So we can save a lot of energy into some energy.

**Index Terms**— Conventional source, Power hump, Kinetic energy, rack and pinion, electric dynamo, zener diode, shaft.

**I. INTRODUCTION**

In the present scenario the power becomes more important for human life. The availability of it and its per capita use of it are regarded as index of national standard of living in the present day civilization. The energy is needed as an input to all sectors of any countries economy. Energy crisis mainly caused due to two factors. firstly due to the rapidly increase of population of world and second is the standard of living of human beings rapidly increased. India is the country which suffers the lack of sufficient power generations. The availability of fossil fuels is the main sources of power generation but there is a fear that they will eventually get exhausted with two decades. Therefore we have to search for other sources of renewable energy. The other sources of energy are solar energy, wind energy, ocean energy.

**II. Components:**

Components used for the setup are listed below.
- Gears
- Chain drives
- Bearings
- Shaft
- Dc motor
- Rack and pinion

**Sl. NO** | **Name of the component** | **Specification**
--- | --- | ---
1. | Motor: | i. Voltage type(12v)  
ii. Type of motor(dc motor)  
iii. RPM(1200rpm) |
2. | Gear: | i. Materials used: mild steel  
ii. No of teeth’s required(56)  
iii. No of teeth (46 on small gear)  
iv. No of gears used :2 (spur gear) |
3. | Spring: | i. Load bearing capacity used:6-7kg  
ii. Materials used : mild steel  
iii. Total displacements :2 inch |
4. | Chain and sprocket | i. No of teeth on big sprocket used :48  
ii. No of teeth on small sprocket used :19  
iii. Distance between the two centers:16cm |
III. Mechanisms:

We can construct the setup by using various procedures. The mechanisms generally used are:

I. Rack and pinion
II. Roller mechanism
III. Air piston

Among all the mechanisms rack and pinion method is very easy to construct and also economical. Rack and pinion: power generator using this is a new type of non-conventional process. Basically it is electro-mechanical energy generating machine. It converts the reciprocating machine into rotary machine. This rotational energy stored in flywheel and it rotates dynamo, then electricity generates. To obtain the reciprocating motion we need load which acts on the speed breakers to produce it. Basically load is the weight of moving vehicle which passes through the humps. All the units are joined by sprocket and chain drive to the shaft. The rack is brought up to the level beneath to the surface of speed breaker. When the vehicles move through it the rack will be push to downward motion. The rack attaches to the pinion which rotates only in one direction only. So this rack and pinion converts the reciprocating to rotary motion. The output of this is connected to the flywheel that controls the fluctuation of energy. The energy can be stored using generator. The kinetic energy stored in the flywheel that is transferred to the dynamo which generates the electricity. There also various components used in the arrangement like spring, sprockets, zener diode etc. The helical springs used in the setup for providing suspension. When the load acts on the hump the racks move forward due to the contract nature of the spring.

IV. Comparisons:

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Parameters</th>
<th>Roller mechanisms</th>
<th>Rack and pinion mechanisms</th>
<th>Air piston mechanism</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Cost of the mechanisms</td>
<td>economical</td>
<td>Moderate</td>
<td>Costly</td>
</tr>
<tr>
<td>2.</td>
<td>Mechanisms setup</td>
<td>Very easy</td>
<td>Difficult</td>
<td>Very difficult</td>
</tr>
<tr>
<td>3.</td>
<td>Maintenance required</td>
<td>Less required as it is simple.</td>
<td>Weekly basis as it’s the best method</td>
<td>Daily basis as it is complex</td>
</tr>
<tr>
<td>4.</td>
<td>Efficiency (in %)</td>
<td>50</td>
<td>70</td>
<td>85</td>
</tr>
<tr>
<td>5.</td>
<td>Designs</td>
<td>Easy to design</td>
<td>Depends upon the weight sustaining capacity</td>
<td>Depending Upon the capacity on air pistons</td>
</tr>
</tbody>
</table>

Energy losses: energy losses during the process are an important factor. We can avoid those losses which presents in every step of the process. Energy loss occurs in the battery which presents in the alternator dynamo. The energy losses are close to 60% of the total energy, so to minimize the energy losses present we should use more mechanical connections wherever possible instead of electrical connections. Considering the cost factor the components of maximum efficiency can be used like NIMH battery should be used as they are the most rechargeable batteries among all.

Damper system: it is the essential system required to support the arrangement. It is required when the speed breakers are pushed down to absorb the shocks occur when the vehicle moves through the speed breakers.

Motion conversion system: it converts the linear part to rotary part by using rack and pinion method. First the rack is a flat, straight like structure which poses the linear motion and second is the pinion part which is gear in circular part which produces the rotary motion.

Energy conversion: so this process shows the conversion of mechanical energy into electrical energy. After getting output as rotary motion the dynamo converts the rotary into electrical energy by cutting of magnetic lines by a conductor. Stepped motor is used to increase the generated power.

Estimation of power: whenever the vehicle moves over the speed breakers it eventually reduces the speed of the vehicle. Generally as the humps are placed up to some height it gains potential energy. When a vehicle weighing 1000kg moves over
the system the damper moves down to 10cm depth. So the total power can be generated 0.98kw. If we calculate the total power per day its amount is huge as like the nonconventional sources. This paper needs a lot of research as it can be a source of non-conventional. 

**Systems:** whenever an armature rotates inside a magnetic field of south and North Pole, an electro motive force is inducted. So for inducting armature coil should be rotated. So to rotate an armature coil it should be connected with shaft. For the rotation the kinetic energy of the vehicle is used. So the power is produced in both directions. So to convert it into one direction zener diode is used. So to get maximum energy the power humps are arranged in series.

V. CONCLUSION

It can implement at metropolitan city as well as in the small villages. So that more electric power can be generated to overcome the power problem. So that more conventional energy can be saved. Arrangement of the whole setup can be easily constructed and maintenance cost of the project is also very economical. The stored electricity could satisfy the daily requirements of electric power in the country. We can use the stored energy for lighten purpose at multiplexes, in the national highway roads, street lights, parking’s etc. we can also design the arrangements for heavy vehicles for the large input torque which increase the output of the generator.

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