iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 3 **Issue:** IV **Month of publication:** April 2015

DOI:

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)

Electricity Generation by Speed Breaker Using Spur Gear Mechanism

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Abstract - The energy Exigence is a bottleneck in the supply of energy resources to an economy. The availability of regular conventional fossil fuels will be the main sources for power generation, but the major worry is that ultimately they will get devoid by the next few decades. Therefore, we have to investigate some approximate, alternatives, new sources for the power generation, which is not depleted by the very few years. So therefore it becomes necessary that we depend on non-conventional sources for power generation. New source of energy is created by the conversion of one form of energy into other. Energy is the primary requirement for survival of all organisms in the world. But population is increasing rapidly and the conventional energy sources are limited. So it creates energy crisis. Therefore to reduce this problem we need to implement the techniques of optimal utilization of conventional sources for conservation of energy. This paper emphasis the idea to use kinetic energy of vehicle when it is passing over the speed breaker. This kinetic energy can be utilized to produce power by using a special arrangement called "POWER HUMP" [1]. This generated power can be utilized for the general application like street lights, highway lights; traffic signals etc. more over that electricity can be stored in a battery for any other general purpose of use.

Keywords – Non-Conventional energy, Spur gear, Power hump, Dynamo.

I. INTRODUCTION

Before the electricity generation began slightly over 100 years ago, houses were lightened with kerosene lamps, food was cooled in iceboxes, and rooms were warmed by wood burning or coal-burning stoves. Direct current electricity has been used in arcs lights for outdoor lightning. The availability and consumptions of electricity is regarded as the index of national standard of living in the present day civilization. Energy is an important input in all the sectors of any countries economy. Energy crisis is due to two reasons, firstly the population of the world has been increased rapidly and secondly the standard of living of human beings has increased. India is the country, which is majorly suffers with lack of sufficient power generation . The capital energy consumption of U.S.A. is about 8000 KWh, whereas as per India is using only 150 KWh U.S.A. With 7% of world population consumes 32% of total power generation where as India as developing country with 20% of world population consumes only 1% of total energy consumed in the world. The availability of regular conventional fossil fuels will be the main sources for power generation, but there is a fear that they will get exhausted eventually by the next few decades. Therefore, we have to investigate some approximate, alternatives, new sources for the power generation, which is not depleted by the very few years. So there for it becomes necessary that we depend on non-conventional energy sources for power generation. While moving must the vehicles posses 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". Before starting we have one question to you all who is really very happy with the current situation of the electricity in India? We suppose no one. So this is our step to improve the situation of electricity with an innovative and useful concept, like Generating electricity from a speed breaker. First of all what is electricity means to us? Electricity is the form of energy, It is the flow of electrical power, It is a basic part of nature and it is one of our most widely used forms of energy. We get electricity, which is a secondary energy source, from the conversion of other source of energy, like coal, natural gas, oil, nuclear power and other natural sources, which are called primary sources [3], [6].

A. Working principle

This paper explains the mechanism of generation of electricity through speed breaker using spur gear mechanism. This mechanism uses the wasted kinetic energy of the vehicle while in motion. This mechanism contains two shafts and four gears of different diameters. It also uses dynamo (generator) and pedal. This mechanism will be arranged below the speed breaker and pedal is connected to speed breaker. When the vehicle passes over the speed breaker with the kinetic energy, the weight of the vehicle is tends to move down and the pedal shaft rotates the sprocket wheel with same rpm. This gives the continues motion to the gear 1 which is connected to the hub. Because of the sprocket wheel, gear 1 gets continuous motion even if the pedal is kept steady afterwards. The motion of gear 1 is transmitted to gear 2 due to meshing with each other .Gear 3 is connected to the same shaft on which gear 2 is mounted. So gear 3 will also rotate with the same rpm of gear 2. Gear 4 is meshed with gear 3 and we will have the more gear ratio. This will help us to rotate the gear 4 with more rpm and thus ultimately, we can get the desired output. Gear 4 is connected to dynamo shaft (or generator).finally a bulb is connected to the dynamo which will glow by getting

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Volume 3 Issue IV, April 2015
ISSN: 2321-9653
International Journal for Research in Applied Science & Engineering Technology (IJRASET)

enough rpm [7].

1) Advantages:

a) This method is economical and easy to control.
b) This method is non-polluting.
c) Installation cost is very low.
d) Maintenance cost is low.
e) This method can be implementing on road (or parking area) and can be used to enlighten street lamps or signals.

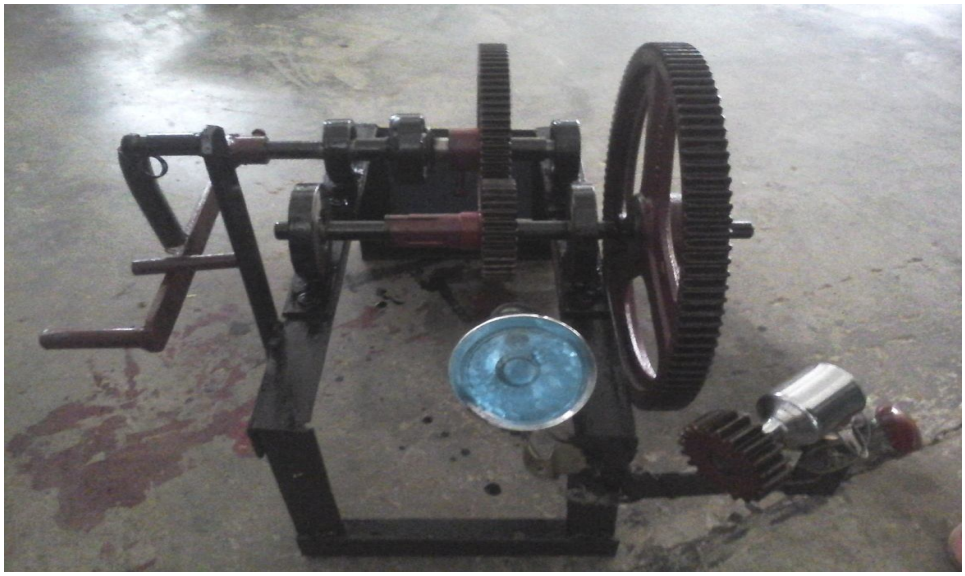


Fig. 1 Spur gear mechanism

When vehicles are running on the specialized Speed Breaker, it will create pressure on the pressure leaver which is kept under specialized speed breaker. As a result gears will rotate and this rotation of the gears will cause the dynamo or DC generator to produce electricity. This electricity can be stored by a rechargeable battery by charging the battery. The produced or stored electricity is used for lighting bulb during night time on the road side [2], [5].

i. Running vehicles
ii. Creating pressure on the pressure leaver which is Keep under specialized Speed Breaker
iii. Result: Rotating Gears of designed system
iv. Produce electricity by dynamo Dc generator
v. Storing energy in rechargeable battery
vi. Power convert to AC If required
vii. Lighting in Bulbs in night time

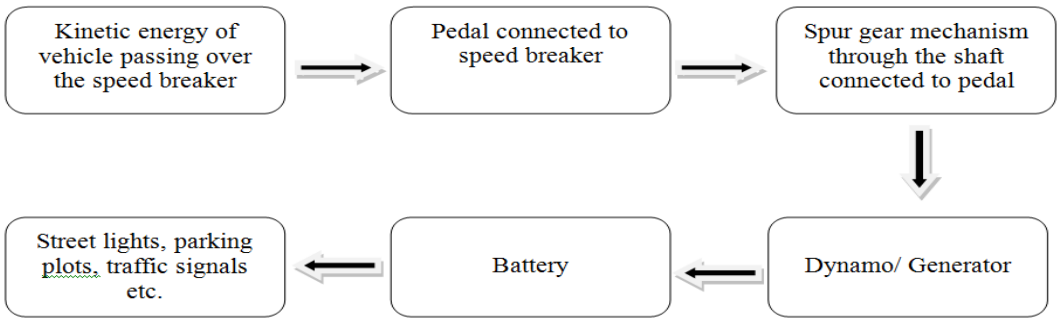


Fig. 2 Block diagram of spur gear mechanism

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Volume 3 Issue IV, April 2015
ISSN: 2321-9653
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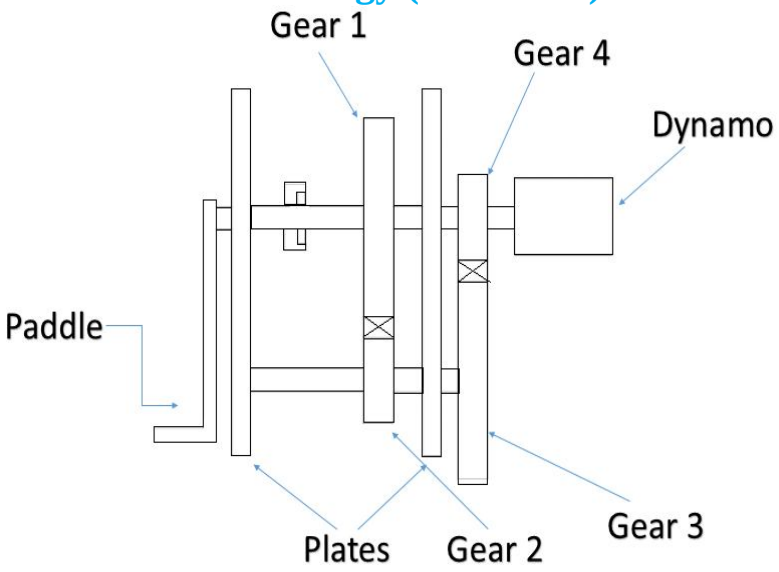


Fig. 3 Schematic diagram of spur gear mechanism

B. Main parts involved

1) Spur gear: It is a positive transmission device with definite velocity ratio. Its volute profile is preferred for adjusting some linear misalignment. It should have high wear and tear, shock absorbing capacity. It can transmit a motion at very low velocity. We have used 4 spur gears of different sizes to get high velocity ratio.



Fig.4 Spur gear.

2*) Thrust bearings:* It is an element, which supports machinery. It permits relative motion between the contacting surfaces while carrying the loads. They reduce the friction and transmit the motion effectively.



Fig. 5 Thrust bearings.

3) Shaft: It is a rotating element, which is used to transmit the power from one place to another place. It supports the rotating elements like gears and flywheels.

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Fig. 6 Shaft.

4) Spring: It is defined as an elastic body whose function is to distort when loaded and to recover its original shape when the load is removed. It cushions, absorbs or controls energy either due to shocks or due to vibrations.



Fig. 7 Spring.

5) Sprocket wheels: The main purpose of the sprocket wheel is that when the pedal moves in opposite direction to get back to its original position , the shaft would rotate in the forward direction only.



Fig. 8 Sprocket wheel.

6) Dynamo: The dynamo uses rotating coils of wire and magnetic fields to convert mechanical rotation into a pulsing direct electric current through Faraday's law. A dynamo machine consists of a stationary structure, called the stator, which provides a constant magnetic field, and a set of rotating winding called the armature which turn within that field. On small machines the constant magnetic field may be provided by one or more permanent magnets; larger machines have the constant magnetic field provided by one or more electromagnets which are usually called field coils.

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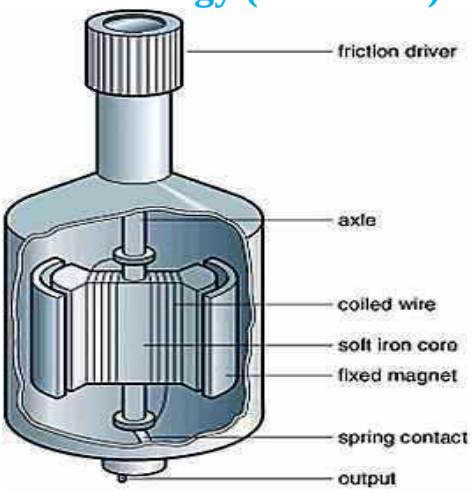


Fig. 9 Dynamo.

II. POWER CALCULATION

Table I Gear Specifications

Sr. No.	Gear number	Outer diameter	Internal diameter	No. of tooth
1	Gear-1	210	192	85
2	Gear-2	90	20	34
3	Gear-3	330	316	105
4	Gear-4	60	20	19

A. Desired gear ratio

$$\frac{T_3}{T_4} = \frac{105}{19} = 5.526$$

$$\frac{T_3}{T_4} = \frac{N_4}{N_3}$$

$$\frac{105}{19} = \frac{N_4}{250}$$

N_4 =1381 rpm

B. Power calculation

Let us consider,

The mass of any vehicle travelling over the speed breaker = 400Kg (Approximately)

m = 400 kg

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Height of speed brake = 12 cm
h =12 cm

Here, Weight of the Body,
w = m×g
w = 400 × 9.81 = 3924 N

Work done = weight of the body x distance travelled by the vehicle
Work done = w×h
=3924 × 0.12
=470.88 Nm.

Distance travelled by the body = Height of the speed breaker
h = 12cm

$$\text{Power} = \frac{Workdone}{Second} = \frac{3924 \times 0.12}{60} = 7.8485 \text{ Watt}$$

Power developed by one vehicle, from one minute breaker arrangement.

Power developed for 60 minutes (1 hr) = 470.88 watt

Power developed for 24 hours = 11.3011 kw

By using this generated power we can lighten street lights, traffic signals etc. [4]

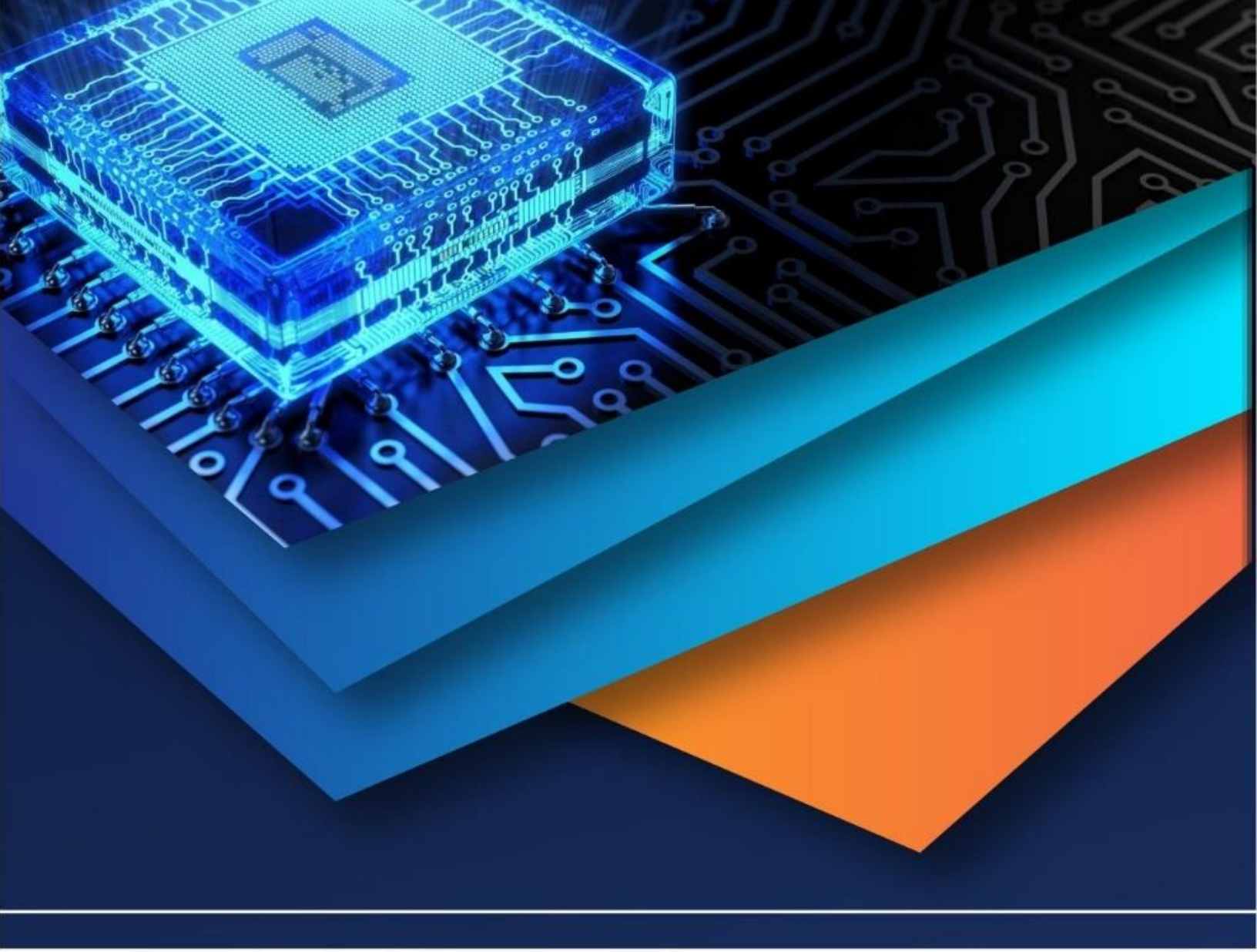
III.CONCLUSION

This project is utilizes waste energy of moving vehicles on road. More and more work is carried out by the engineers and developers to make changes in design and parts of such device to get maximum efficiency and minimum power loss. The future of power generation would rather be fully dependent on such projects. Looking at the present scenario of energy in developing country like India, this mechanism can be implemented and the electricity thus produced can be used in various ways. The main aim of this project is to utilize waste kinetic energy, thus we arrive to a conclusion that such project should be encouraged by Indian government for the betterment of the society and to make best use of single part of energy available around us. Energy is the source of life hence it should be used very effectively and should not be wasted. Any work needs energy to be completed and this era one cannot think life without energy as right from the moment we wake up in the morning till the time we go to slip, we are totally dependent on electricity. Thus it is to be preserved and used very efficiently.

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