Green power generation from road traffic using speed breaker

Avinash Rishabh kumar[1], Lavepreet Singh[2], Yuvraj Bhardwaj[3], Manish Singh[4] and Rajneesh Kumar[5]
[1-5]Department of Mechanical Engineering, Galgotias University, Greater Noida

Abstract- **Due to the rapidly increasing emissions of fossil fuels and the limited amount of power currently available, renewable power generation is essential need of time. In the present article, we tried to represent a well explained analysis for power reducer which aims to use the weight and momentum of passing vehicles to produce electricity to save "waste" power. This design uses struts to restore the bumps to their original location, a slider crank mechanism that converts reciprocator motion into rotator motion, and a gear driven which transmits power. The diverse and economical design of speed breakers is also a viable option that can be installed under the railroad with minor modifications.**

Keywords: Power generation, Speed Generation, Electricity, connecting rod, strut, bumps, disc crank, Kinetic Power, Mechanical Power, Vehicle.

I. INTRODUCTION

As the population continues to grow and the ability to spend on transport is increasing, daily traffic on the roads of India is increasing significantly. [7] Says that pollution from fossil fuel emissions is increasing in cities such as Delhi, especially in, and this makes the use of renewable power a top priority. Rama dental. [11] Underscores the increasing need to devise power recovery methods, as such developments today limit even fossil fuels and require wise use. In addition, such a recovery system will be the answer to what Sorrell [12] has called a long term problem of climate change. This article proposed an idea to reuse the power lose from a vehicle which passes through a speed breaker. The crank slider mechanism was activated due to the mas-sand momentum of the vehicle presses the speed bump. The reciprocator motion of the bump is converted to the rotational motion of the crank. This movement is fur-there transmitted from the gear train assembly to the generator, and the generator can generate electricity. Thus, the "Generation Speed Breaker" makes good use of the kinetic power of today's high-traffic traffic and converts it into electrical power as suggested by the Rao.[11]. Adaptive CAD and CAE analysis-its importance is Ho emphasized by etal.[5]-was launched to introduce In today's era of increasing demand for living and industrialization, electricity demand is occurring, and the graph is increasing every day. In Bangladesh, the latest data show that only 31% of the population uses electricity. Conversely, in rural areas, only 23% of the population does not have electricity. So, to get out of this problem, we have to think about some of the power sources that are becoming very popular. Renewable power sources including biogas, solar, wind and tidal synchronization concepts [1]. This will help meet future needs.

II. DESIGN CALCULATION

The ability to innovate to achieve that purpose. It is proving to be a renewable power project that can bring the best benefits for ecosystem, as emphasized by Fatima and Mustafa [3]. This leads to a self-contained roadway as it is proven to be an easy way to generate power that can be easily reused for working with CCTVs, street lights, and other road accessories. It can be done using various types of sensors and microcontrollers which can better utilize the generated power as suggested by Kshirsagar [6].

2.1 Design of Vibration-Struts

The main part of the configuration is that the speed breaker should get back to its typical situation after some time after the specific time stretch when the vehicle disregards it. Likewise, the speed switch should not surpass its normal situation. To meet every one of the necessities, the framework is stringently damped. The framework is rearranged as demonstrated in Figure. Regarding Figure 1 (a) and the examination of a solitary level of opportunity of the vibration, the estimation of the framework is finished to ascertain the regular recurrence of the damper, firmness, and damping coefficient. As indicated by control [13], the speed of the vehicle on the speed switch is20 km/h, and the wheelbase of the bike is 1.8 m. Subsequently, the knock should get back to its centre situation inside 0.25 seconds. For a fundamentally damped framework, the damping factor n = 1 and the condition of movement is

$$x = (A + Bt)e^{(- \omega nt)} \text{ where,}$$

Xn-regular recurrence of the framework (rad/sec) x-dislodging of the mass from its mean position (taken negatively in descending course) (m) A and B are the constants that can be accessed from the given limit conditions and, t is the time like a flash.

According to the imperatives referenced over, the limit conditions are at t = 0 : x =10 cm and x'= 0 furthermore, at t =.25sec : x =0

Subbing Eq. (2) in Eq. (1), we get A= - 0.1 m and B=-0.01xn.

Subsequently, the condition of movement

$$X= - (0.1+ 0.1\omega t) e^{-\omega t}$$

Presently, subbing Eq. (3) in Eq. (4) and accepting 99% of unwinding in the spring as is finished by Rao [16], we get,

$$- \quad 0.001= - (0.1+ 0.1\omega t)e^{-\omega t}$$

Tackling the above condition, characteristic recurrence ω = 7.80 rad/sec. Rules [9] recommends the standard components of a hindrance. Utilizing those qualities to

ascertain the mass of the knock and taking the material of the knock as Mild Steel, we get

The volume of speed bump= .05900 m^3 the thickness of gentle steel is =7850 kg/m^3 Mass of the bump=.05900*7850=463.41kg We realize that ω=√k/m m=463.1kg we get k=28000.5 Likewise, damping co-proficient, c =2k/ω= 2×28000.5/7.80=7179.6. Various estimations of firmness and damping co-proficient for general estimations of wheelbase for a bike have been determined and the outcomes appeared in fig

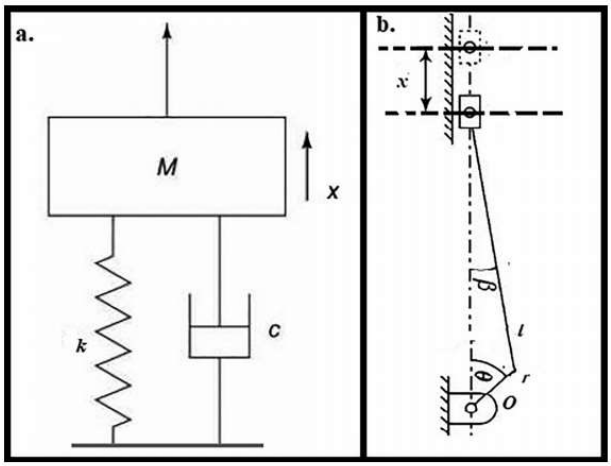
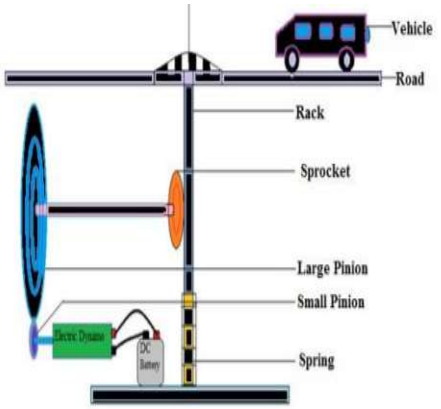


Fig. 1. (a) Simplified spring-damper system; (b) Crank-slider mechanism.

2.2 constructions

As we see when any of the vehicle passes on the road through the speed breaker, rack will automatically moves in the downward direction. It will continuously rotate the sprocket and the pinion that will connect to Rack [5] in the same manner. As we see in the diagram the Pinion is directly connected to the DC generator shaft, so that it will generate [4] the electricity. The time and the position will depend on the speed and the time taking by the moving vehicle on the road when it passes through the speed breaker.



2.3 Computer aided designing-

The segments of the speed breaker framework are planned and gathered to build up a model of the framework. The plan occurred in Solid works 2016 Student Edition. The parts are effectively accessible and are planned with affordable sizes and materials. The reason for the PC helped plan (CAD) is to: -

1) Obtain the right direction of the segments and their measurements for assembling purposes.
2) Review complex subtleties to help segment producing and create segment and gathering diagrams.

The components are follows-

2.3.1 Connecting rod-

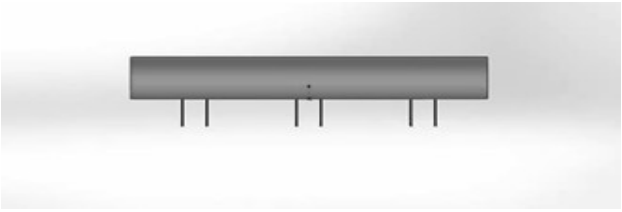
The connecting rod is the link that connects the bump to the crank. There are holes on both ends for mounting on bump and disc cranks using M12 bolts. The proposed dimensions were used to calculate the critical buckling load.

2.3.2 strut-

The Macpherson Strut

It is designed in a McPherson strut type consisting of a damper and a spring. There are suit-able installation positions on the top and bottom, and are tightened with the bump and bottom platform using M12 bolts.

2.3.3 Bump-



The Designed Speed Bump

The knock was planned as appeared. It comprises three arrangements of mounts, two of which are situated at the two finishes for mounting the supports and one in the center for mounting the associating bars of the slider wrench component. The knock is 50 cm long and 15 cm wide and has a semi-roundabout cross area. The mount is made on a 3mm thick IS2062 rating E250 sheet.

2.3.4 Disc crank-

The Disk with crank arrangement

The plate wrench is a circle type wrench as demonstrated in the figure. There is an opening 4 cm away from the middle to join the interfacing pole utilizing M12 bolts. It is intentionally mounted on a shaft with an external measurement of 24.4 mm. The width of the circle is 10 cm. Utilizations a one-plate wrench that is not difficult to plan and fabricate. Made on a 4mm thick IS2062 Grade E250 sheet.

III. COMPARISION BETWEEN RACK-PINION AND ROLLER

Rack-Pinion Rack-The lone strategy used to remove a voyaging vehicle M.E that converts power into another type of force by a pinion instrument. The force created as the vehicle goes through the street in the reducer slips under the shaft, which goes about as a specialist for the revolution of the shaft of the DC generator [11]. Then again, in the roller component, squandered force assists with producing power.

Sl. No	Parameters	Roller Method	Rack-Pinion Method
1	Cost	Cheap	Moderate
2	Mechanism setup	Very easy	Difficult
3	Maintenance	Highly required	Less required
4	Efficiency	~50%	~70%
5	Design	Easy to design	Depends upon weight Sustaining capacity
7	Height	5.08 cm	12 cm
6	Dependency	Mostly in roller	Mostly in spring

Table 1: Comparison between two mechanisms

Rack-Pinion procedure will rely upon the spring however roller doesn't rely upon the spring. While utilizing the spring their strength is some issue. That will be the significant hindrance of various sprocket freewheel will be the freewheel board is joined by driver-side bearing [13]. This will show the outcome as axel will be under full pressure. That will break the axel.

IV. DATA COMPARISION

In the system of Rack-Pinion, when any vehicle is passing out and about for 1min on the speed breaker, it will give 19.61 watts. In any case, in the component of Roller, when any vehicle is passing on the street for 5 sec then it will give 8.1 watts of force. For the 1 min, it expanded to 121.5 watts of force. Allow us to think about the information in 1 day; just the 6 hours will be the season of a speed breaker. Shows the accompanying table will show the information -

Time (Sec)	*Power in rack-pinion Mechanism (watts)*	*Power in roller Mechanism (watts)*
60(1 min)	19.62	121.5
3600 (60 min)	1177.2	7290
21600 (6 hour)	7063.2	43740
86400 (24 hour)	28252.8 (28.25 kW)	174960 (174.96 kW)

Table 2: Power Generated by Rack-Pinion and Roller.

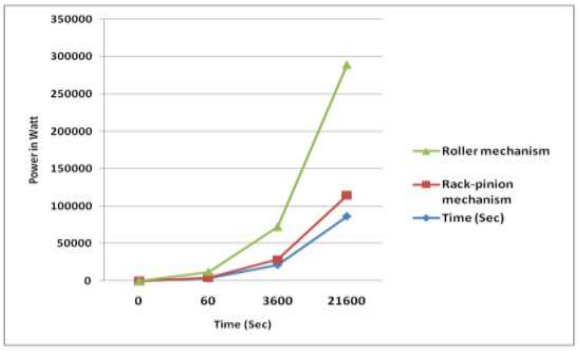


Table 3: Graph showing power v/s Time of Two mechanisms

The above graph will show the data over the 24hrs . In this graph 6hrs will considered for the useful assumption.

We can also predict from this graph that Rack-Pinion[10] is always less than the roller mechanism.In order to get the best efficient result we can predict it by joining the both technique.Our paper will shows up the both mechanism for speed breaker.

V. BLOCK DIAGRAM OF BOTH MECHANISM

The following diagram will shows the block diagram of the both mechanism. This will helps to increase the efficiency [13] of the system this happens because of merging two mechanisms at the same time, but the maintenance cost will be very high.

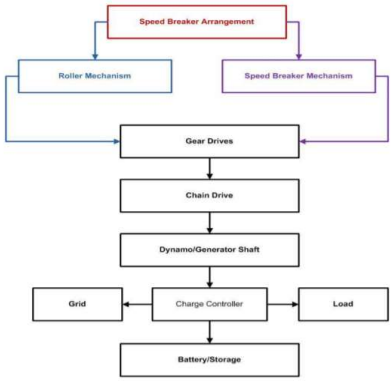


Figure 4: Block Diagram of Both Mechanisms.

VI. CONCLUSION

In this paper, we planned an advanced speed breaker that proposes a strategy for creating power utilizing the force of a moving vehicle. In the current situation, the plausibility of the thought is checked by considering vehicle traffic streams, and so on, and power is assessed from it. The power sizes examined can be utilized in the domain of different street embellishments. The determined electrical force produced in 24 hours in the planned framework is 1.602 kWh.

Time investment funds and effectiveness gains can be accomplished by utilizing the two components simultaneously. The vast majority of the outcomes give more proficient ability to meet our future necessities. Around here, more exploration is being accomplished for the proficient turn of events. Our papers and undertakings have been effectively executed as a Green Power Project that helps convert dynamic force into power.

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