



# Power Generation from Busy Roads for the Development of Smart City

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**Abstract:** The world is facing electricity crisis with the difference in demand and deliver and restricted range of natural sources. So there is a need for saving energy and requirement of other non-conventional resources that is cheap and feasible. This paper try to deal with how electric energy may be generated from busy street with the use of speed breaker. In huge metro cities the quantity of automobiles will increase tremendously every year. The other way to generate the energy through tapping on the normal speed breaker with the simple mechanism. The power generated is stored for street lighting and to be used in rural areas. Additionally power saving is purpose of this paper, with the usage of microcontroller and a few digital devices we on – off the lights.

**Keywords:** Speed breaker, Non Conventional energy, Generator, Microcontroller, Street light.

## I. INTRODUCTION

Electricity is the most varied and widely used form of energy. An energy crisis is any excellent bottleneck (or charge rise) inside the supply of power sources to an economy. Energy disaster can develop due to Overconsumption, Overpopulation, Delay in Commissioning of Power Plants, Wastage of Energy. Sometimes bottlenecks at oil refineries and port centers limit fuel supply. An energy crisis can rise up because of over use of the sources and wastage of energy generated. Another major problem, which is becoming the exiting topic for today is the pollution. Power stations and automobiles are the major pollution producing places. So non-conventional power source is needed to reduce this problem. We proposed a nonconventional power generating system based on speed breaker mechanism which generate electricity without using any commercial fossil fuels, which is not producing any polluting products This project addresses the issues of energy saving as well as technology and the usage of simple mechanism of a speed breaker on a busy street. Energy modifications from one form to the other". When a car actions over the speed breaker there are lot of energies involved in the process,energy due to friction, ability energy, heat and many others. Are lost to the surroundings.

The idea is to utilize and convert the potential energy due to the weight of the vehicle to electrical energy.when the vehicle passes on this speed breaker it converts the linear motion torotational motion by spring mechanism.The spring mechanism consists of spring and the gear system, when the speed breaker is pressed the spring compresses and inturn rotates the driver gear with the combination of gear system it rotates the shaft of the generator.The electricity generated by the generator is stored in the rechargeable battery.

The second part of this paper is an efficient use of simple electronics. Many times the street lights are kept ON in broad daylight or when there is no traffic on the road at midnight. Energy can be saved by switching ON the lights whenever and wherever necessary. Half of the lights can be switched OFF when there is no vehicle on the road and all can be switched OFF in broad daylight. LDR"s are used to detect day and night and two infrared sensors are used at the two ends of the road to detect any activity the road.

## II. LITERATURE REVIEW

The idea was first implemented in South Africa due to their electrical energy crisis,has made them to light up small villages on the highways.The idea of basic physics to convert kinrtic energy into electrical energy that goes waste when the vehicle runs over the speed break was used.Since then a lot as been done in this field.

➤ **Author 1: Aniket Mishra - "Electricity generation from speed breaker"**. This paper explains the mechanism of electricity generation from speed breakers. The load of the vehicle is acted upon the speed breaker system is transmitted to the rack and the pinion arrangement. Rack and pinion can convert rotary to linear or from linear to rotary motion. Rack is a linear gear and pinion is a circular gear. Applied force on rack is converted to rotation



by pinion. The mechanical force is converted into rotational force. This mechanism has is more used than other mechanism, due to its high efficiency compared to other mechanism.

➤ **Author 2: Prathibha Arun** –“Eco-friendly electricity generation using scintillating piezo” This paper explains that the electricity is produced from the mechanical stress on the crystals due to Piezoelectric effect. The piezoelectric effect exists in two domains, the first is the direct piezoelectric effect and it describes the material’s ability to transform mechanical strain into electrical charge. In second form it has the ability to convert an applied electrical potential into mechanical strain. Thus in this paper it generates the energy needed for charging batteries to light the street at night and also for the city consumption of electricity. It is very encouraging to get good voltage and current at such a low cost at the same time utilising the waste energy.

➤ **Author 3: Akashay Tank** – “Eco-friendly energy generation through speed breaker”. This paper emphasises on the idea that the kinetic energy getting wasted while vehicle moves can be utilised to generate power using special arrangement of spring or piston assembly with water tank. As the vehicle runs on the speed breaker due to its weight the top portion of the speed breaker moves downwards hence moving the spring or piston arrangement, due to this force applied on the piston or spring mechanism in the water tank the water comes outside of the tank. This water is passed on rotor blade which rotates the chain belt which in turn rotates the generator.

➤ **Author 4: Pranay Vijay Ashtankar** –“Road power generation by flip plate mechanism”. It is on idea that the vertical motion on top of the flip plate is converted into rotational motion for generation of electricity. The flip plate mechanism is very simple. It is based on the principle as in the case of electricity generation in hydroelectric power plant, thermal power plant, nuclear power plant, geo-thermal energy, wind energy, tidal energy etc.

### III. CIRCUIT DIAGRAM

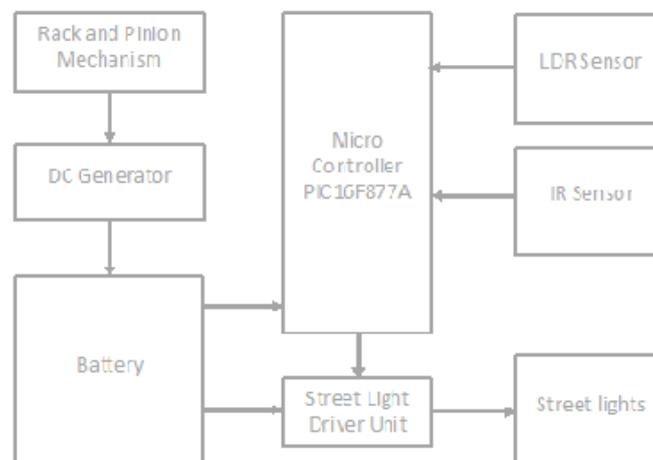


Fig 1: Circuit diagram of the power generation

The setup is concerned with generation of electricity from the speed breaker. When load of the vehicle acted upon the speed breaker, the power is generated by the generator. The generated AC power is converted to DC by the full bridge rectifier. Then it is provided to relay and street light. The voltage sensor is used to check the power generation. A 230V to 12V stepdown transformer is used as an external power supply. Microcontroller is used as a switching circuit, to turn on or off during a particular signal. Here we use LCD for displaying the power generation, voltage and current. GSM is used to receive any fault detection in the circuit. LD and IR sensors are the energy saver device.

### IV. METHADODOLOGY

When the vehicle passes on the speed breaker the force is exerted vertically on the lever, then the force is transmitted to the pinion and to the rack arrangement which comprises of gear mechanism, by this arrangement it converts linear motion to rotational motion.

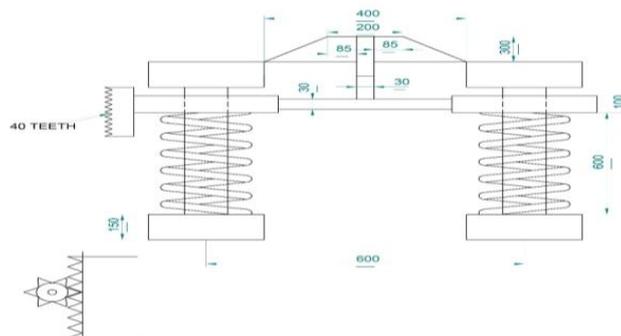
Generator shaft is rotated by the rotational motion of the gear and power is generated by the generator. Thus power generated is stored in rechargeable battery. Hence the stored energy is used to light up the street-lights. Microcontroller PIC16F877A is used in this paper, which is used as a switching device and controlling device.



Fig 2 : Mechanism

Voltage and current sensor are used to measure input and output voltage and currents. LCD is used to display the power generation, voltage and current. GSM technology is used to detect the fault such as generation fault , ground fault etc. LD sensor is used to check the intensity of light, it turns on the street lights during nights times. IR sensor consists of transmitter and receiver. It checks the activity on the road. Whenever the vehicle passes, it automatically on the street light with the control of microcontroller.

## V. DESIGN



Let us consider, the gear ratio of :

$$a/b = 28/22 = 1.27$$

$$c/d = 50/13 = 3.82$$

One downward movement of 'a' will cause 1.27 revolution of 'b'.

So at 'd' we get ,

$$= 3.828 * 1.27$$

$$= 4.82 \text{ revolutions}$$

The dc generator ratings ,

$$\text{Voltage} = 5\text{V}$$

$$\text{RPM} = 600$$

$$\text{Power} = 0.5\text{W}$$

We assume that it takes 1 sec for contraction and 1 sec for relaxation,

The revolution made at the shaft for one push is 4.82

$$\text{The generator rps} = 600/60$$

$$= 10\text{rps}$$

$$4.82/10 = 0.48$$

$$= 48\%$$

The generator now runs at 48% of its rated speed

So, the generated voltage will be

$$= 5 * 0.48$$



$$= 2.4 \text{ V}$$

The generated current is 60mA

The power generated is 0.144W

From one push it generates 0.144W for 2 sec

Let us assume 100 pushes in 1hr

$$= 2 * 100 * 2$$

$$= 400 \text{ sec}$$

$$400/60 = 6.67 \text{ min}$$

Therefore, Total power generated in one hour =  $(6.67 * 0.144) / 60$ ;

$$= 0.016 \text{ Whr}$$

$$= 16 \text{ mWhr}$$

## VI. ADVANTAGES

- Electricity can be generated without polluting the environment.
- No fuel requirement.
- The mechanism is simple and to be constructed.
- Requires less man power for operational process.
- Power generation is cost effective.
- It uses non-conventional energy source.

## VII. APPLICATIONS

- Street lights.
- Road signals.
- Sign boards on the roads.
- Lighting of the bus stops.
- Lighting of the check post of the highway.

## VIII. CONCLUSION

Looking at the recent condition of the electricity crisis in India, government focuses on utilising the non conventional energy source for electricity generation and reducing the share of global warming. So, the technique described in the paper will also contribute to the power generation. The existing source of energy such as coal, oil etc may not be adequate to meet the ever increasing energy demands. This conventional sources of energy are also depleting and may be exhausted. There are some non-conventional methods of producing energy this project is one step to path of exploring the possibilities of energy from several non-conventional energy source. This project will be help full to solve some of the electricity shortage problems.

## IX. FUTURE SCOPE

- The shortage of light can be reduced at some extent.
- Wastage of energy of vehicles passing on road can be minimised.
- Such speed breakers can be designed for heavy vehicles, thus increasing input weight and ultimately increasing output of generator.
- More suitable and compact mechanism to enhance efficiency.
- It may be used for light vehicle also.

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