

ELECTRICITY GENERATION FROM SPEED BREAKER

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Abstract - This paper presents few of the power generation methods in the vehicle suspension system. The pressure is applied when vehicle passes over a road bump. The kinetic energy generated from suspension system is converted into electrical power by using piezoelectric mechanism. To overcome the problems of energy impasse we need to implement the techniques of optimal utilization of conventional sources for conservation of energy. This paper includes how to utilize the wasted energy of vehicle when it passes over a speed breaker.

Key Words: Speed Breaker, Piezoelectric transducer, Power generation, Kinetic Energy, Arduino nano, etc.

1. INTRODUCTION

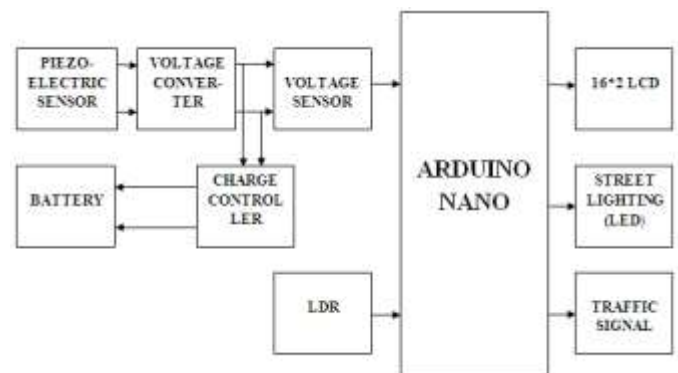
On road, vehicles waste a massive amount of energy on speed breakers, to control the speed of vehicles there is necessity to provide speed breaker. The annual rate of accretion of motor vehicle population in India has been almost 20 percent during the last decade. There is cosmic vehicular growth in year by year. The increase in traffic and number of speed breakers on road encourage to manufacture an innovative implement which can channelize the wasted energy of vehicles on speed breakers to some beneficial work.

In this paper, it is mainly focused on the principle of Potential Energy to Electrical Energy Conventional. Potential Energy can be released or converted into other forms of energy including Kinetic Energy. If 'h' is the height above an arbitrarily assigned reference point, then kinetic energy of an object is the extra energy which it possesses due to its motion. Energy which is gained during its acceleration, the body maintains this kinetic energy unless its speed changes. To return the body to a state of rest from that velocity, negative work of the same magnitude would be required. The working of mechanism to generate power by converting the potential energy generated by vehicle going up on a speed breaker into kinetic energy is explained in this paper. When the vehicle moves over the inclined plates, it gains height resulting in increase in potential energy, which is wasted in a conventional rumble strip.

2. DISCRIPTION

In this block diagram, we use piezoelectric transducer as an input supply to the voltage converter, which converts AC supply to DC supply. This DC output of converter is given to a 12V/7A battery through charge controller, and its output is given to the voltage sensor. Sensor output is given to ARDUINO NANO. LDR, LCD, LED, and Traffic light is controlled using ARDUINO.

3. BLOCK DIAGRAM



4. PIEZOELECTRIC TRANSDUCER

A piezoelectric transducer is a device which uses the piezoelectric effect, to measure changes in pressure, temperature, strain, or force by converting them to an electric charge. An early application of piezoelectric transducer technology occurred during World War I with the use of SONAR, which used echoes to detect the presence of enemy ships. For piezoelectric transducer, crystal made from quartz used as a primary material. Due to low leakage rates quartz gives superior stability and slow measuring at varying parameters. In the early 1950s, piezoelectric ceramic took hold as the primary transducer material. Because it offers ability to be manufactured in wide variety of shapes and sizes, capability of operating efficiently at low voltage and ability to work at temperatures up to 300 degree Celsius in comparison with other materials. Rochelle salt also works incredibly well in transducers, which is a synthetic crystal. It produces the highest output of any other material discovered in thus far. When force or strain is applied on the plains of piezoelectric transducer/sensor it is measured and

then output is gained in the form of voltage or electric charge due to piezoelectric effect.

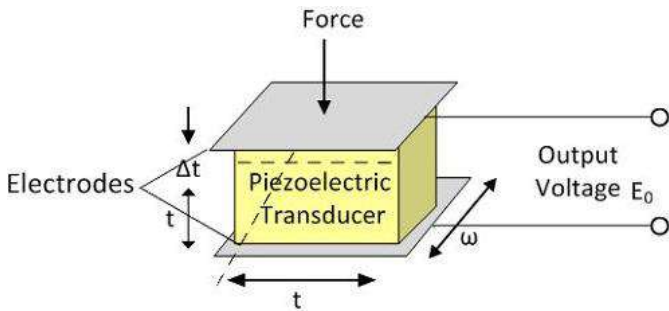


Fig [1] Piezoelectric Transducer

Piezoelectric transducers are self generating, accessible, flexible and they give high frequency response. In our project, multiple no. of piezoelectric transducers are mounted at a specific points below a bump of speed breaker. They can be used for ample applications for industrial, environmental and personal use. Widely, they are used in residential products like motion and object detectors, pest preventative and in home security alarms.

5. CALCULATION

In order to calculate the electric voltage generated from the deformation of the piezoelectric material/transducer, it is fundamental to know the following parameters. The equation gives the voltage generated by mechanical load acting on determined plane of piezoelectric transducer.

Thus,

$$V = P * t * g$$

Where,

V is the generated voltage in Volts.

P is the applied pressure in Newton.

t is the thickness of piezoelectric material.

g corresponds to the constant gravity which is equivalent to 9.81 m/s^2 .

6. RESULT

On Piezoelectric element, basic electrical tests were performed for the purpose of evaluation and verification of electrical properties. There are two independent tests performed by direct impulse are as follows:

- 1) Voltage generation
- 2) Current generation

Voltage generated by direct impulse: By each piezoelectric element, value of the voltage generated librates between 1.0 to 2.89V. It is shown in Fig [2]

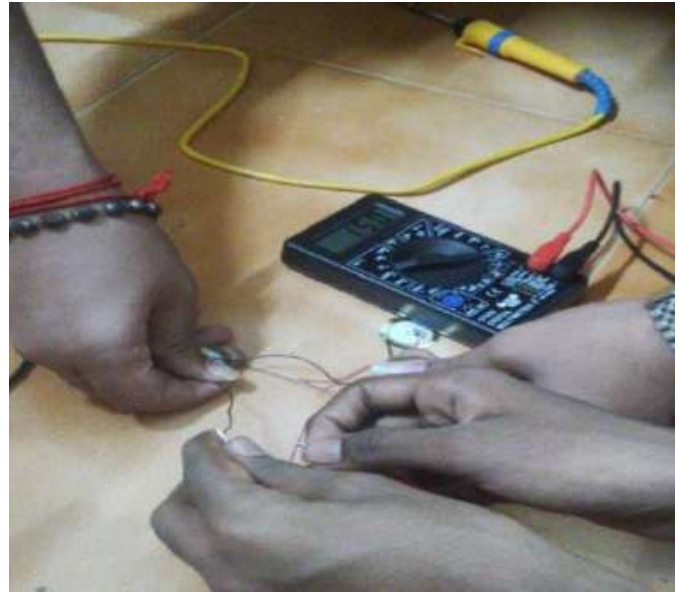


Fig [2] Voltage measurement

The piezoelectric output is used for street lighting as one application in our project. Fig [3] presents the output of one piezoelectric element used to make LED glow.

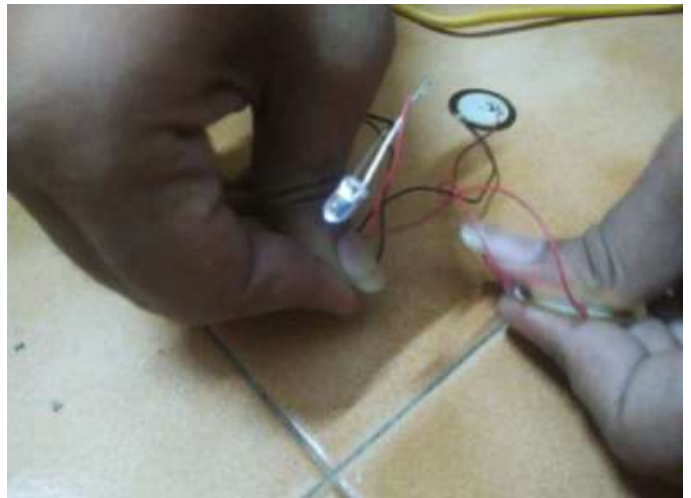


Fig [3] Application

The arrangement done by using no. of piezoelectric sensors implemented below the speed breaker, connected to each other at specific points as shown in Fig [4]. The overall circuitry is as shown in fig [5]. It consists of different apparatus required for getting output and applications to use produced output energy.



Fig [4] Speed Breaker Arrangement

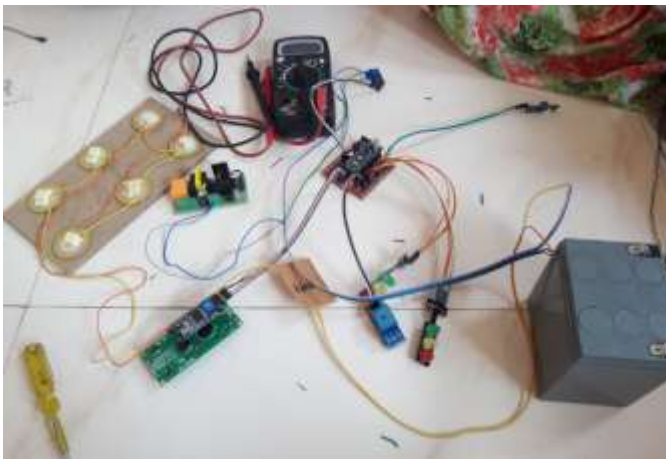


Fig [5] Overall circuit

7. CONCLUSION

In this fast moving world, electricity is today's intrinsic requirement but in comparison with its generation, demand is very cosmic. In our project, wasted energy from motile objects is successfully invested in useful work. On the other hand, the design and the implementation work with the help of electronics is with the tests and was quenched with the objective of work. Speed breakers on road generate ample amount of electricity with this method as they are continuously in use. Still in India, this method is not in practice broadly. Finally, generation with this type of method can be recommended since the piezoelectric generation systems are clean, accessible and reliable as they have long life.

8. REFERENCES

- [1] Sathesh Kumar R, AarthyK, Gayatri M and Anusuya B, "Power Generation by Energizing the Speed Breaker using Piezo Electric Transducers for Automatic Street Lighting", International Journal of Engineering Science and Computing, Vol.8, Issue No.3, March 2018.
- [2] Mukti Nath Gupta, Suman and S.K. Yadav, "Electricity Generation Due to Vibration of Moving Vehicles Using Piezoelectric Effect", Advance in Electronic and Electrical Engineering, ISSN 2231-1297, Volume 4, Number 3, (2014), pp.313-318.
- [3] Pratibha Arun V., Divyesh Mehta, "Eco-friendly Electricity Generator Using Scintillating Piezo", International Journal of Engineering Research and Applications, Vol.3, Issue 5, Sep-Oct 2013, pp.478-482.
- [4] Abhishek Gupta, Nikita Mittal, Pushpendra Pal Singh, Ram Arora, Ramkishan Dhakar, Purab Chand, Piyush Mangal, "Electricity Generation From Speed Breakers", International Journal of Electrical and Electronics Research, Vol.4, Jan-March 2016.
- [5] Mrs. S.S. Pitre, Mr. Rahul Raj, Mr. Sachin Raina, Mr. Akash Bhoria, Mr. Alok Kumar, "Electricity Generation Using Speed Breaker", International Research Journal of Engineering and Technology (IRJET), Vol.05, March 2018.
- [6] Yoram Astudillo-Baza, Manuel Alejandro Lopez Zepeda, Manuel Torres Sabino, "Getting Electric Power For Piezoelectricity", The International Journal Of Engineering and Science (IJES), Volume 5, Issue 12, pp.38-43, 2016.
- [7] C.H. SREEKRISHNAN, RAVI PRATAP SINGH, SATYA BAMA, "STUDY ON POWER GENERATION USING SPEED BREAKERS", International Journal of Advances in Electronics and Computer Science, ISSN:2393-2835, Volume-4, Issue-12, Dec-2017.

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