Generation of Electricity through Speed breaker

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ABSTRACT- The idea of piezoelectricity, which is lost every day, is the basis for the energy-generating use of speed breakers. The speed breaker's piezoelectric material mechanically deforms as a result of the kinetic energy the vehicle introduces, producing electricity. When stress is applied to piezoelectric materials, an electric charge is produced. This phenomenon is exclusive to crystals lacking a center of symmetry. Electrical circuits can be used to rectify, enhance, and collect the charge created by applying stress. Numerous methods for utilizing piezoelectric materials to generate energy have been put forth. We have demonstrated in this research that piezoelectric materials can be applied to the surface of road speed breakers to generate green and effective energy. LED street lights may be lit with the energy generated. Following their passage through the breakers, vehicles will apply stress to the piezoelectric material, causing it to distort and producing AC voltage. We must convert this AC power to DC before using it directly so that we can store it in a lithium cell or battery. Sometimes the voltage generated might not be enough to meet our needs, in which case we can utilize the booster circuit to increase the voltage. Since it is low-cost, emits no pollution, and is a sustainable and renewable energy source, this method has a great chance of becoming the energy harvesting method of the future generations.

Keywords: Speed Breaker, Piezoelectric Material. Boost Converter, Arduino Microcontroller

1.INTRODUCTION

Every moment of our daily existence requires energy. We can obtain energy in a number of ways, the most popular being the conventional techniques. Due to intensive use throughout time, conventional energy sources including coal, oil, and natural gas have considerably depleted. Environmental pollution and global warming are also caused by conventional energy sources. Therefore, the development of alternate energy sources is required. unconventional energy produced by solar, wind, biogas, and other clean, renewable sources. Because non-conventional energy is clean, renewable, sustainable, and environmentally benign, it must be adopted. Solar and wind power are the most widely used non-conventional energy sources. This research focuses on energy harvesting utilizing piezoelectric materials for speed brakes.When a crystal is under mechanical stress, a phenomenon known as piezoelectricity occurs, which is the emergence of an electrical potential across its sides. Every vehicle that crosses a road often expels enough kinetic energy when it collides with a speed limiter. This kinetic energy can be captured and transformed into potential energy. By utilizing the speed breaker as a power-generating device, we may harness the energy produced and generate power. A piezoelectric generator can be incorporated into the speed breakers to transform the mechanical energy of the moving vehicle into electrical energy.

2.LITERATURE SURVEY

1] C. R. Sullivan and M. J. Powers-A photovoltaic array maximum power point tracker is presented. In a solar-powered vehicle, components are tuned for the trade-off between weight and power loss, yielding an efficiency of over 97%. A reliable auto-oscillation technique is used by the control circuit. It is demonstrated that there is no need to measure and multiply the array voltage and current; instead, control is just dependent on the output current measurement. Discussion is held over several local maxima that result from the solar array's partial shadowing.

2] Mukti Nath Gupta, Suman - With the amount of power required to run them, gadgets made possible by recent advancements in ultralow power microcontrollers enable never-before-seen degrees of integration. These are chip-based systems that use aggressive power-saving techniques, like turning off power to inactive functions. In fact, these devices require so little power to operate that many Since sensors are easily powered by batteries, they are becoming wireless. Regretfully, changing batteries on a regular basis requires expensive and time-consuming maintenance. Harvesting the ambient mechanical, thermal, or electro-magnetic energy in the sensor's immediate surroundings might be a more efficient wireless power option. A comprehensive energy harvesting solution designed for high impedance sources like piezoelectric transducers is the LTC3588-1, as seen in Figure 1. It has a high efficiency synchronous buck converter and a low loss full wave bridge rectifier that move energy from an input storage device to an output at a regulated voltage that can handle loads of up to 100mA. The LTC3588-1 comes in a 3mm x 3mm DFN package and a 10-lead MSE version.

3]J.Kymissis,C. Kendall,J.Paradiso,- Microelectronics' power needs are continuing to decline In some wearable subsystems, batteries may start to be replaced by environmental energy sources. In keeping with this attitude, this article investigates three distinct gadgets that can be integrated into shoes, where extra energy can be easily extracted, and utilized to "parasitically" produce electricity while walking. A unimorph strip made of piezoceramic composite material and a stave built of a multilayer laminate of PVDF foil are two examples of these that are

piezoelectric in nature. A rotating magnetic generator positioned on a shoe makes up the third. These systems' test results are presented, together with a discussion of the advantages and disadvantages of each, along with recommendations for future developments and wearable system applications. A system had been constructed around the piezoelectric shoes as a self-powered application example, and it periodically broadcasts a digital RFID as the bearer walks.

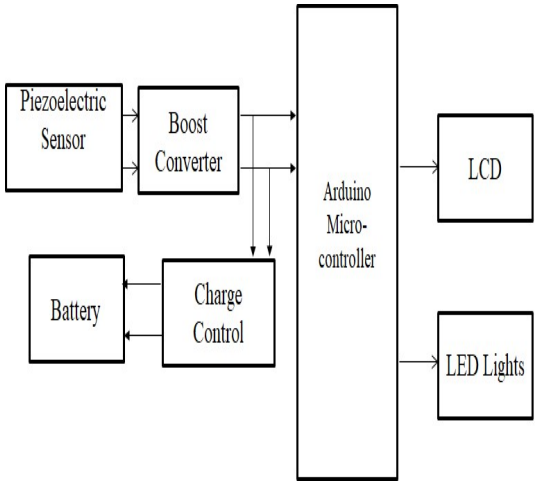
3.EXISTING SYSTEM

For the first time, experimental data are presented in this study that show how to apply a bias charge at the start of each half cycle of motion to increase the power output of piezoelectric energy harvesters. The transduction process is not responsible for the ultimate power limits of inertial energy harvesters; rather, it is solely dependent on the device size and kind of excitation. But in practice, devices typically operate much below the theoretical limit, frequently due to the inability to obtain a strong enough transducer damping force. In these situations, we demonstrate how a pre-biasing method increases the generator's efficacy and provide simulation findings backed by experimental evidence. These findings demonstrate that the piezoelectric generator's efficacy is enhanced by over ten times when compared to a purely optimized resistive weight. In actuality, the voltage breakdown of the components we chose limited our gains.

4.PROPOSED SYSTEM

The process by which speed breakers generate power is explained in this project. The piezoelectric sensor receives the vehicle load acting on the speed breaker mechanism. The force or pressure applied on the speed-breaker is then transmitted to the sensor, where the piezoelectric effect further transforms the pressure into a tiny electric charge. The purpose of this charge is to charge or activate a capacitor that is linked directly to a battery. Now that this controlled charge has been preserved, it can be used at night to power street lights by being kept in the storage battery during the day. In order to transform electrical energy into mechanical vibration, the piezoelectric effect is employed in transducers and force or displacement sensors, among other sensing devices.energy (usually sound or ultrasound) in actuators, which are used to operate generators and multi-span beams, among other things. The system's size, weight, and cost are its limiting factors. Using the piezoelectric effect to generate energy could be one way to address the current energy issue. Our speed breaker model uses this effect to generate electricity. Batteries are used to store the electricity produced by the setup for use in daily activities later on.

4.1 BLOCK DIAGRAM



5. SYSTEM REQUIREMENTS

HARDWARE DESCRIPTION

5.1Power Supply

The 12V advanced step-down transformer is powered by an AC source. The 12V AC transformer is rectified by means of a diode connection. A capacitor separates the 12V DC diode bridge yield.

5.2 LCD Display

Fig 5.2 LCD Display

LCD displays characters, numbers, and designs. The microcontroller's (P0.0–P0.7) I/O port is interfaced with the showcase. Multiplexed mode is used for the presentation. The next showcase flashes on in 1/tenth of a second. Because of Vision's diligence, the show will result in a continuous display of tally.

5.3 ARDUINO UNO R3 MICROCONTROLLER

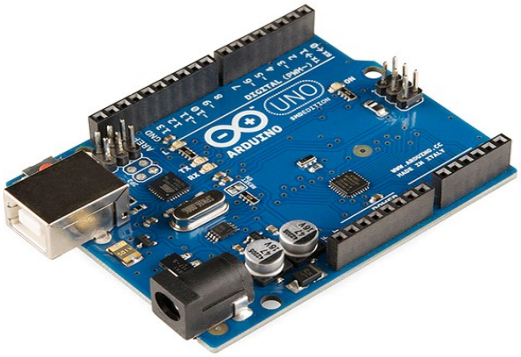


Fig 5.3 Arduino Board

A microcontroller board based on the ATmega328 IC is called the Arduino Uno R3. There were 6 analog inputs, a 16 MHz crystal oscillator, a USB port, 14 digital input/output pins (six of which may be utilized as PWM outputs), a power button for resetting, an ICSP header, and a jack. Everything required to support the microcontroller is included; all that's left to do is power it with a battery or an AC-to-DC adapter or connect it to a computer via a USB cable.

5.4 Battery

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A sort of rechargeable battery called a lead-acid battery was initially developed in 1859 by French physicist Gaston Planté. It's the original kind of rechargeable battery produced. Lead-acid batteries are not as energy dense as contemporary rechargeable batteries. In spite of this, the cells have a comparatively high power-to-weight ratio due to their capacity to provide significant surge currents. These characteristics, in addition to their affordability, make them desirable for use in automobiles to supply the high current needed for starter motors. Because of "double sulfation" when depleted, lead-acid batteries have a comparatively limited cycle life (often less than 500 deep cycles) and longevity.

5.5 Piezo Electric Sensor

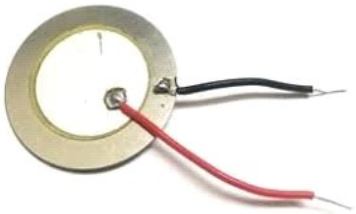

Fig 5.5 Piezo Electric Sensor

By converting changes in pressure, acceleration, temperature, strain, or force into an electrical charge, a piezoelectric sensor measures these changes. Piezoelectric transducers can be described as proportional voltage sources and filter networks because of their extremely high output impedance. The applied force, pressure, or strain is directly proportional to the voltage V at the source. This mechanical force is related to the output signal as though it had gone through the corresponding circuit.

7.CONCLUSION

In this study, we have synthesized electricity for lighting street LEDs by combining piezoelectric materials with a spring-based dampening system. Due to its availability, efficiency, and speed, piezoelectric electricity is a formidable rival to solar power. Conventional energy sources are running out daily, as is well known. As a result, we must enhance present techniques for coming up with new ideas in order to concentrate our attention on sustainable and innovative renewable energy sources. As a result, we looked into a novel technique called piezoelectric energy harvesting. Based on our observations and computations, we concluded that the approach is highly feasible and will involve several future extensions and studies. Because piezoelectric materials are custom-made, their uses vary based on factors like cost, power generated, rigidity, etc. Future improvements could include the use of an application software and microcontroller to track the energy collection process. The capacitor voltage can be measured using a microcontroller, and the data can then be sent to application software for recording and visualization.

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