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An Approach to Generate Electricity by Using Piezoelectric Sensor and Dynamo

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ABSTRACT

The production of electrical energy has become increasingly crucial in power systems due to rising demand. Various methods for generating electrical energy include those that rely on fuel consumption. A new method of electrical energy generation involves using piezoelectric sensors to harness energy from pressure or vibrations. The energy harvested can either be stored in batteries for later use or used directly to power loads. Piezoelectric sensors possess the distinctive capability to generate electricity when exposed to mechanical stress or pressure, making them ideal for applications in power generation.

Keywords: Electrical Energy Generation, Self-Powered Systems, Power Generation From Vibration, Harvesting Mechanical Energy, Vibration-To-Electricity Conversion, Green Energy Solutions, Piezoelectric Applications

I. INTRODUCTION

In today's world, everything has gone digital; every digital device requires DC power to function. Some devices rely on batteries, while others utilize power supplies. However, there are several renewable resources available in the world, such as solar, wind, and hydropower. In this context, another type of power generator has emerged that is not yet widely recognized: the piezoelectric power generator. Throughout history, humanity has increasingly needed and utilized energy for survival and well-being. As a result, numerous energy resources have been depleted and misused. The proposal to harness the waste energy generated by foot traffic during human movement is particularly relevant and significant for densely populated nations like India, where places such as railway stations and temples are constantly crowded. By designing the flooring with piezoelectric technology, the pressure exerted on it creates electrical energy that is captured by floor sensors, converted into an electrical charge by piezo transducers, and subsequently stored to be used as a power source.

II. METHODOLOGY

Energy Generation As the tiles are pressed, piezoelectric elements generate a small voltage, and the dynamo rotates, generating AC power.

Power Conversion The generated AC from the dynamo is rectified into DC using a bridge rectifier, which is then stored in a 12V battery.

Power Distribution A DC-to-AC inverter converts the stored energy into 230V AC, capable of powering devices like laptops and mobile phones.

Safety Features Circuit breakers are installed to protect against overload or short circuits, and an Arduino- based indicator shows the charging status.

III. MODELING AND ANALYSIS

Figure 1: Pizoelectric Sensor

Figure 2: Component Position

Figure 3: Model Of Project

IV. RESULTS AND DISCUSSION

The average values of voltage and current produced by piezoelectric sensors and a dynamo are utilized to determine the total power generated. Assuming that 200 footsteps exert pressure on the piezoelectric transducer over a duration of two hours, the current generated by this system is capable of powering both AC and DC loads. The force applied to the piezoelectric sensor results in the production of 4000 watts of electricity. This system represents an intelligent approach to energy generation.

- It is a smart energy generating system.
- It is made to be durable,
- It has an approximate life of 5 years

V. CONCLUSION

Power generation through the use of piezoelectric sensors and dynamo technology presents numerous advantages, such as the conversion of mechanical energy into electrical energy, thereby fostering sustainability by utilizing available energy sources. This method facilitates remote energy generation, enhances energy efficiency, and offers potential cost reductions. Furthermore, it mitigates environmental impact by tapping into otherwise unused energy. Piezoelectric sensors are adaptable and scalable, making them suitable for a variety of applications. They play a significant role in promoting a greener and more efficient future in energy generation, thereby decreasing dependence on non-renewable resources. This innovative technology has the capacity to transform energy production and distribution, optimizing resource use while minimizing ecological damage. It provides a sustainable and decentralized approach, broadening electricity access in remote regions. By leveraging the capabilities of piezoelectricity, we can advance towards a more sustainable and environmentally conscious energy framework.

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