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Smart Seat

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Abstract: ***Smart Seat: When a person seats on a seat, certain amount of pressure is applied on it. If we install certain amount of piezoelectric sensor in a seat. With the help of pressure, we can generate voltage. Piezoelectric sensor is a device that uses the piezoelectric effect, to measure changes in pressure, acceleration, temperature, strain, or force by converting them to an electrical charge. Using the sensor under the seat the pressure generated by a person seated on a chair can be sensed by sensor and generate electricity. Mainly piezoelectric material that can generate a voltage proportional to the stress applied upon it. This paper is based around this process. There will be springs attached under the seat also. When pressure is applied on the spring there will be equal pressure applied on a sensor which is attached in the bottom of every spring. With this we can generate a considerable amount of voltage to use it in future by storing it in a rechargeable battery. If the pressure is more applied on the sensor, then we can generate more voltage through the process.***
Keywords: Sensor, Battery, Piezoelectric, Seat, pressure.

I. INTRODUCTION

The word ‘piezo’ is derived from the Greek word for pressure. The piezoelectric effect was discovered by Jacques and Pierre Curie in 1880.They found that pressure applied to a quartz crystal creates an electric charge in the crystal, a phenomenon they referred to as the (direct) piezoelectric effect. In the subsequent century, research has been performed into the development of materials with improved piezoelectric properties, enabling commercial utilization of the piezoelectric phenomenon. To date, the number of applications of piezoelectric materials is still increasing

II. CONSTRUCTION

A quartz crystal is a piezoelectric material that can generate a voltage proportional to the stress applied upon it. For the application, a natural quartz crystal must be cut in the shape of a thin plate of rectangular or oval shape of uniform thickness. The nature of the piezoelectric effect is closely related to the occurrence of electric dipole moments in solids. Theoretically, an electric dipole is defined by the first-order term of the multipole expansion. With the help piezoelectric sensor attached on the seat we can generate voltage by the pressure created by a person sitting on the seat. There will be springs attached under the seat also. When pressure is applied on the spring there will be equal pressure applied on a sensor which is attached in the bottom of every spring. With this we can generate a considerable amount of voltage to use it in future by storing it in a rechargeable battery. If the pressure is more applied on the sensor, then we can generate more voltage through the process.

A. Requirements

1) Piezoelectric sensor
2) Connecting wires
3) Rectifier
4) DC DC converter
5) Rechargeable Battery
6) Chair

If we use it in large scale, we can generate more voltage. We can connect piezoelectric sensor in series and set it in a seat to get more voltage from it. This can be implemented in large scale in an IT company, school, college where many people used to seat on a chair. We can install 10-20 piezoelectric sensor in a single chair. If there are 100 chairs, we can install the sensor in all of them and connect them in a series connection and store the generated voltage in a rechargeable battery or any kind of rechargeable storage. The voltage stored in the rechargeable storage can be used in future. When the voltage is fully used the storage can be recharged again through the piezoelectric process. Mechanical energy appears everywhere in the nature, road vibration energy created by the vehicle will not only do damage to pavement structure, but also is difficult to collect.

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Utilizing electromechanical conversion characteristics of piezoelectric material, gather the vibration energy when vehicle passing on the pavement, and design the piezoelectric transducer package box, for traffic lights along the roads, signs, and so on. Save the cost of laying long distance transmission line, also take full advantage of the loss of energy. We can also lay piezoelectric sensor in the floors of a railway station, shopping mall where we can find many people walking around all the time. The amount of pressure we are getting is very good for a high efficiency voltage result.

III.MODELING AND ANALYSIS

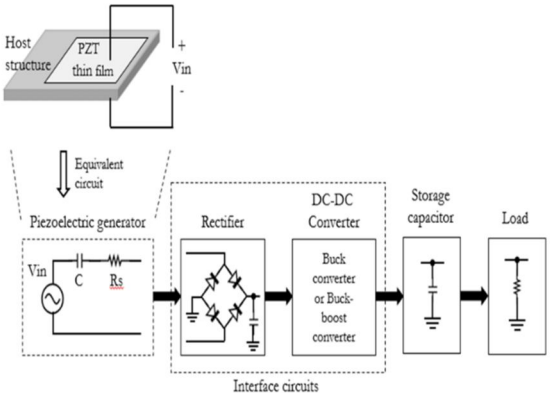


Figure 1: Circuit Diagram

We are using Piezoelectric sensor and applying pressure on it with the help of bias-flip rectifier which can extract power with four times improvement compared to commonly used full bridge rectifier. With DC DC power converter that steps up voltage (while stepping down current) from its input (supply) to its output (load). We can store the voltage in a battery.
Technologies: Piezoelectric effect, Bias flip rectifier process, DC DC power conversation process.

IV. RESULTS AND DISCUSSION

We have piezo plate and connected to a rectifier in a small test and connected a DC-DC converter (Buck converter or Buck-Boost Converter), then it goes to storage capacitor or a rechargeable battery. Finally, it gets connected to the load.



Figure 2. Rechargeable Battery

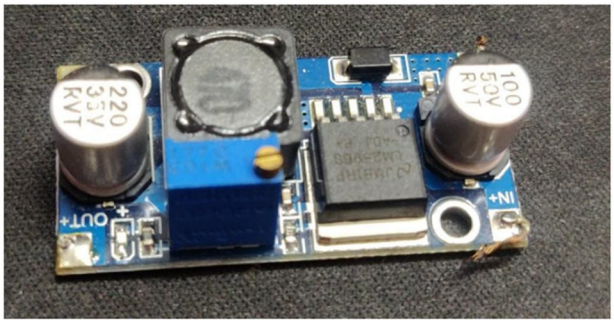


Figure 3. DC-DC Converter

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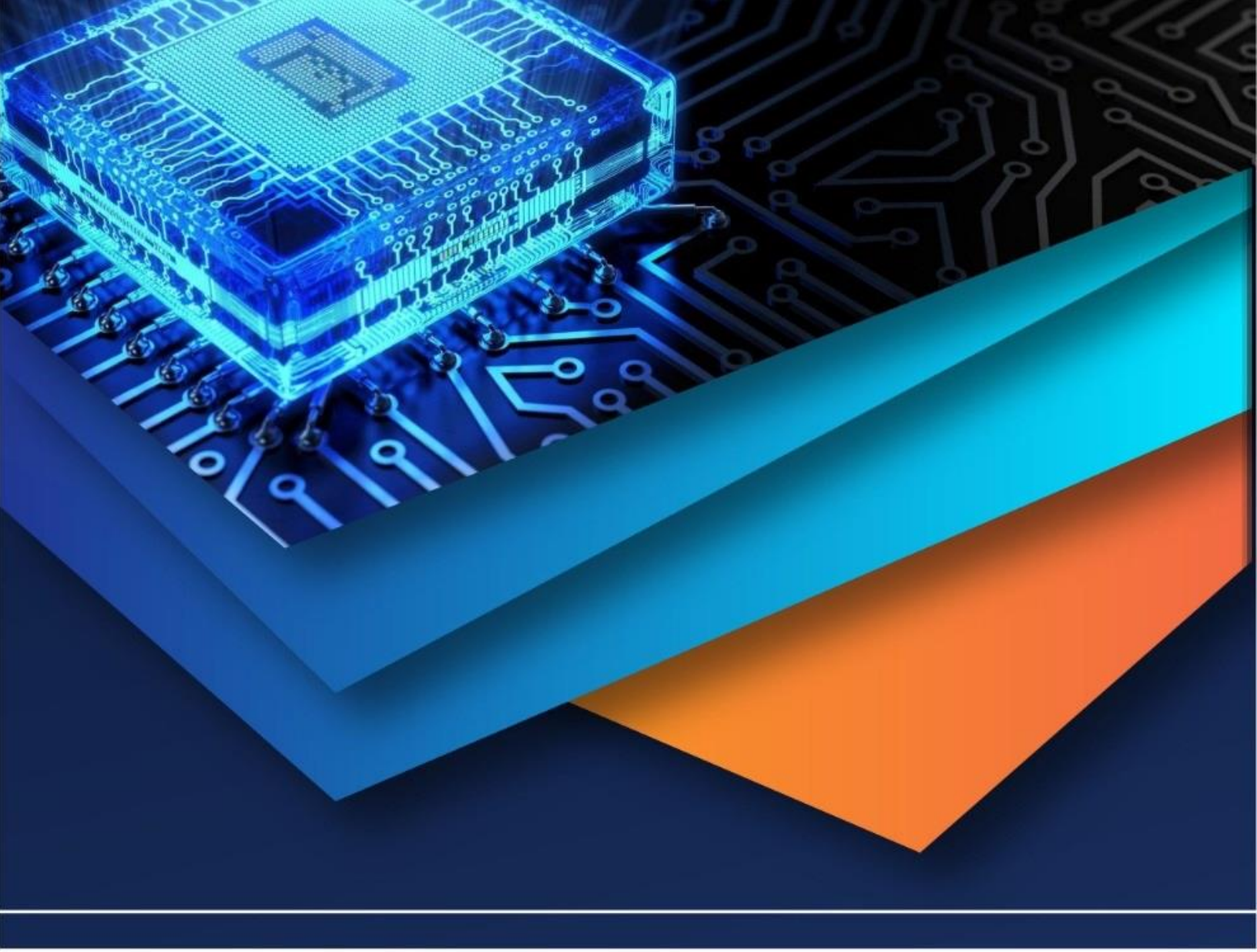
V. CONCLUSION

If we can initialize this project in large scales in companies, school, and colleges. We can generate voltage from creating pressure on a chair. By this way we can conserve natural resources, reduce the manufacturing cost of generation of electricity, preserve the environment. And our main goal is to decrease our dependence on fossil fuels. This process also helps the organization to get less electricity bills, because by piezoelectric process organizations can generate their own electricity.

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