



e-ISSN: 2278-8875

p-ISSN: 2320-3765

# International Journal of Advanced Research

in Electrical, Electronics and Instrumentation Engineering

Volume 9, Issue 12, December 2020

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

**Impact Factor: 7.122**

9940 572 462

6381 907 438

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# A Review on Free Electricity Generation Using Piezoelectric Crystal by Pressure

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**ABSTRACT:** This is review paper on Free Electricity Generation Using Piezoelectric Crystal by Pressure. The purpose of this paper is to provide a solid explanation for the generation of reliable amount of power by using conversion of mechanical energy into electrical energy using piezoelectric materials. The aim is to find a suitable & efficient source of electrical energy by using our surrounding, I've used the mechanical energy produced from our footsteps in order to produce sufficient and reliable amount of energy. Index Terms-Energy harvesting, piezoelectricity, piezoelectric effect, energy conversion.

**KEYWORDS:** Piezoelectric Sensor, Full-wave bridge rectifier, , AVR Microcontroller, Transformer.

## I. INTRODUCTION

Now a day's energy is one of most important issues around world especially in countries where energy crisis is huge problem. As we all know about natural resources will finish one day. That's why researchers are trying to finding out energy sources from nature. That must be not dangerous for the environment. Humans have earlier started to utilizing energy harvesting technology in form of windmill, geothermal, solar energy & piezoelectric material and etc. They are also known as renewable energy which is generated from natural resources. These Renewable energy harvesting plants generate MW level power; it's called micro energy harvesting technology. Micro energy can also be produced from these natural sources that are called micro energy harvesting plants. This Micro energy harvesting technology that is based on mechanical vibration, mechanical stress & strain, which can generate mW or  $\mu$ W level power. Our Vision is to generate electrical energy from vibration & pressure using piezoelectric material.

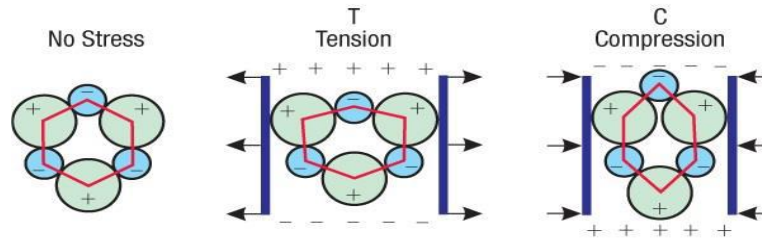


Fig. 1. Piezoelectric Effect

## II. LITERATURE SURVEY

Niraj Panthi, Anuj Gupta , Ebin Baby, Santhosh U.G Student, Department of Aeronautical Engineering, NMIT, Bangalore Assistant Professor, Department of Aeronautical Engineering, NMIT, Bangalore The first purpose of our project is to design such a type of generation plant which can effectively make power without any use of fuel, like coal in thermal power plant, nuclear fuel in nuclear power plant and any kind of other energy, So that the preservation of environment can happen and the environment can stay at good condition.

Nur Amalina Ahmad Nawir, Amat Amir Basari and Mohd Shakir Md. Saat, Ng Xue Yan and Seiji Hashimoto Faculty of Electronics and Computer Engineering, Universiti Teknikal Malaysia Melaka, Durian Tunggal, Melaka, Malaysia Centre for Telecommunication Research & Innovation, Faculty of Electronics and Computer Engineering, Universiti Teknikal Malaysia This paper presents the recent concern on the power requirements of Wireless Sensor Nodes and the studies on the development of energy harvesting system using piezoelectric devices. Ambient Energy harvesting is one of the alternatives in replacing the use of batteries and wiring where small amounts of energy from environmental sources such as solar, air flow or vibration is harvested to form an electrical energy

Dhananjay Kumar, Pradyumn Chaturvedi and Nupur Jejurikar Samrat Ashok Technological Institute, Vidisha (MP), India-464001 [djaydelhi@gmail.com](mailto:djaydelhi@gmail.com), [pc220774@gmail.com](mailto:pc220774@gmail.com), [n28388@yahoo.co.in](mailto:n28388@yahoo.co.in) This paper describes the design of energy harvester prototype and the power conditioning circuit. The optimization of extracted power out of the piezoelectric tile has been presented. The generation of electric energy when some load is applied on the sensors either in the form of direct strain or ambient vibration depends upon various factors such as number of piezoelectric transducers, electromechanical coupling coefficient of the piezoelectric sensors, amount of load applied, and also on the scheme of arrangement

## III. PROPOSED SYSTEM DEVELOPMENT

### *Piezoelectric Crystal*

One of most suitable methods for obtaining the energy from footsteps is by using piezoelectric crystals. Piezoelectric crystals are one of small scale energy sources. Whenever the piezoelectric crystals are subjected to vibration; they generate a very small voltage, commonly known as piezoelectricity. The piezoelectric crystals has crystalline structure which converts an applied vibration into an electrical energy, piezoelectric effect exists in two properties: The first is the direct piezoelectric effect that express the material's ability to transform mechanical strain into electrical charge. The second form is converse effect, which is ability to convert an applied electrical potential into mechanical strain energy. These properties allow the material to function as a power harvesting medium.

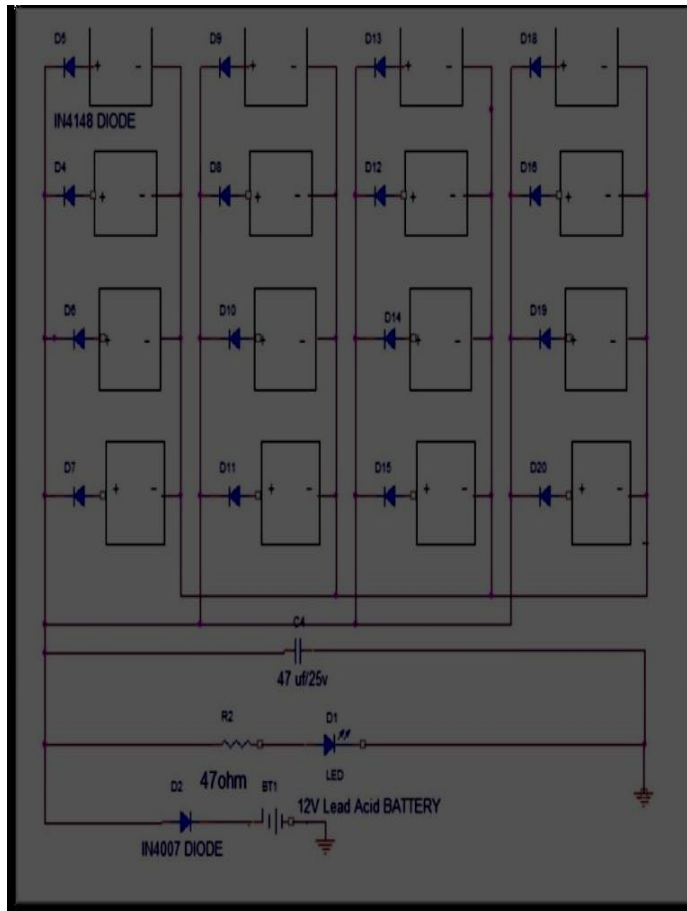


Fig.2 Construction of Piezoelectric Sensors

FUNDAMENTAL OF PIEZOELECTRIC ENERGY HARVESTING

Piezoelectric materials belong to a wider class of materials called ferroelectrics. Ferroelectric material has a property that their molecular structure is oriented in such a way that material can exhibit local charge separation, known as an electric dipole. These electric dipoles are randomly oriented throughout material composition, but when material is heated above certain point known as Curie temperature, and very strong electrical field is applied, electric dipoles reorient themselves relative to electric field; this process is called polling. After material is cooled, dipoles maintain their orientation and material is known as poled. After the completion of the polling process the material will exhibit piezoelectric effect.



Fig 3. Piezoelectric Crystal



This crystal uses piezoelectric effect to measure pressure, acceleration, strain or force by converting them into an electrical signal. Piezoelectric sensors have proven to be adaptable tools for measurement of various processes. They are used for quality assurance, process control & for research & development in many different industries; it was only from 1950's that use of piezoelectric effect for industrial sensing applications gained its importance. Since then, that measuring principle has been increasingly used & can be regarded as mature technology with an outstanding inherent reliability. It has been successfully used in various applications, such as in medical, aerospace, nuclear instrumentation, & as a pressure sensor in the touch pads of mobile phones. In automotive industry, piezoelectric elements are utilized to monitor combustion when developing internal combustion engines.

#### IV. CONCLUSION

Here we are introducing a new source of generation of electricity.

Power produced in this experiment is proportional to weight applied on piezoelectric sheet.

To produce 0.325Ahr power, nearly 1000 steps are needed.

To charge a 12 V battery completely, 4 to 5 days are needed

Running cost is imperceptible of project because here no special fuel is required like other power generating stations.

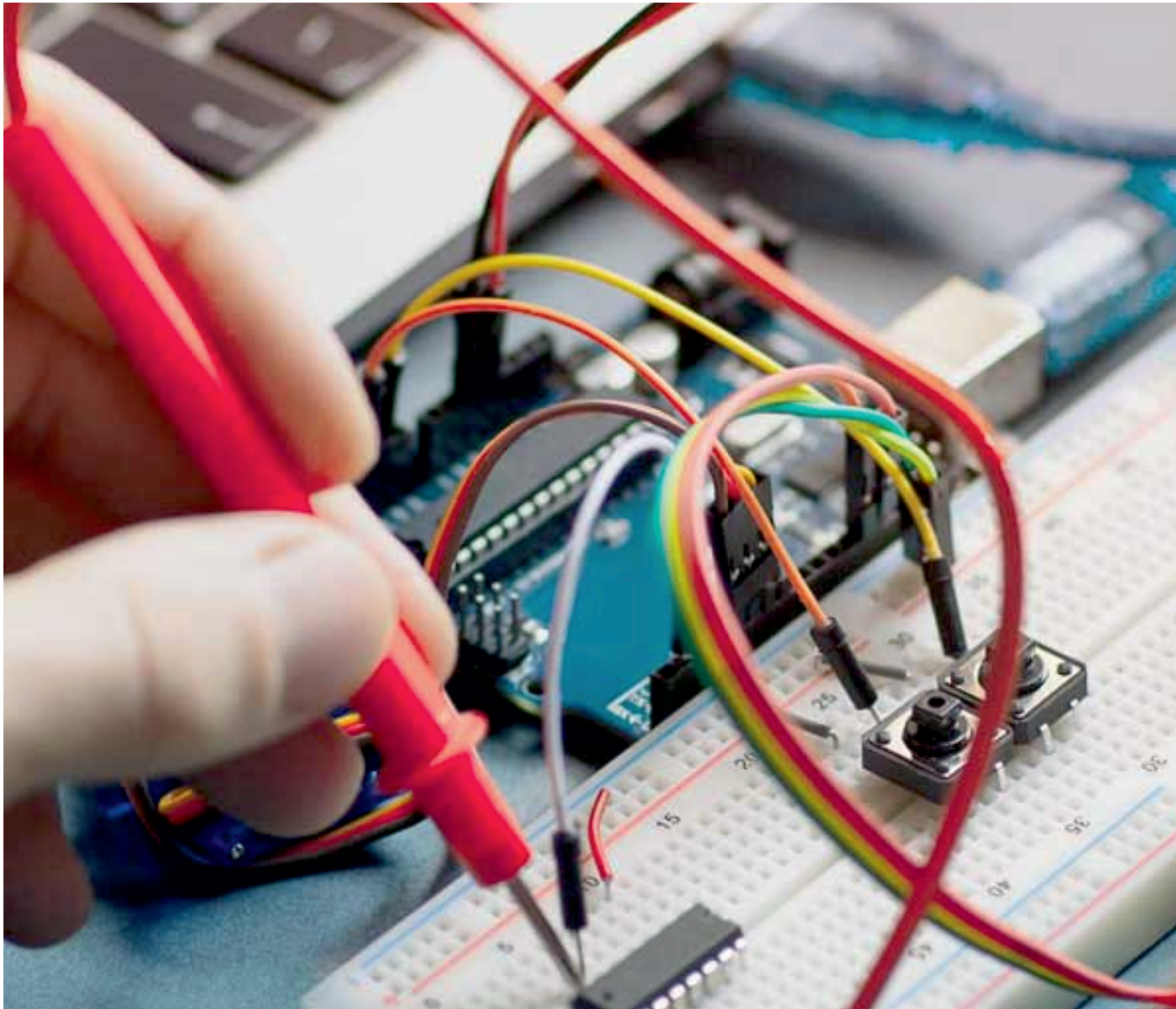
There is no pollution with this technology as compared to other power generating technologies; hence it is eco- friendly in nature.

Untapped Mechanical energy associated with footsteps is used for generation of electricity.

For more generation of electricity, more pressure is required hence project can be successfully execute in crowded areas.

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