www.ijprems.com
editor@ijprems.com

INTERNATIONAL JOURNAL OF PROGRESSIVE RESEARCH IN ENGINEERING MANAGEMENT AND SCIENCE (IJPREMS)

Vol. 02, Issue 05, May 2022, pp : 380-381

e-ISSN : 2583-1062

Impact Factor : 2.205

STUDY OF FOOTSTEP POWER GENERATION USING PIEZOELECTRICE

Mrs. Sonal Sapra[*1], Saurabh Verma[*2], Vivek Kumar[*3]

[*1]Assistant professor, Department of EEE, Raj Kumar Goel Institute of Technology 5KM stone , Delhi-merrut road Ghaziabad (U.P) 201003, India.

[*2,3]Final Year, UG student, Dept. of EEE, Raj Kumar Goel Institute of Technology 5KM stone , Delhi-merrut road Ghaziabad (U.P) 201003, India.

ABSTRACT

Man has needed and used energy at an increasing rate for his sustenance and wellbeing ever since he came on the earth a few million years ago. Due to this a lot of energy resources have been exhausted and wasted. Proposal for the utilization of waste energy of foot power with human locomotion is very much relevant and important for highly populated countries like India and China where the roads, railway stations, bus stands, temples, etc. are all over crowded and millions of people move around the clock. This whole human/ bio-energy being wasted if can be made possible for utilization it will be great invention and crowd energy farms will be very useful energy sources in crowded countries.

The concept is to capture the normally lost energy surrounding a system and converting it into electrical energy that can be used to extend the lifetime of that system's power supply or possibly provide an endless supply of energy to an electronic device which has led to power harvesting.

Keyword: Piezoelectric sensor, Battery, Electricity, Foot step power generation.

1. INTRODUCTION

Energy harvesting has been a topic of discussion and research since three decades. With the ever increasing and demanding energy needs, unearthing and exploiting more and more energy sources has become a need of the day. Energy harvesting is the process by which energy is derived from external sources and utilized to drive the machines directly, or the energy is captured and stored for future use. With the advent of technology, utilization of energy sources has increased by leaps and bounds. Piezoelectric Energy Harvesting is a new and innovative step in the direction of energy harvesting. Not many researches have been carried out till now in this field, hence it is a challenging job to extract energy from piezo-crystals. In this research paper, description of the basic working of a piezoelectric crystal is mentioned. Then later in the paper, the idea of combining energy from a number of piezoelectric crystals to obtain higher voltages is proposed. Certain ways of implanting the crystals at different places have also been sited in the paper. Fundamentals of piezoelectric material Piezoelectricity is the ability of some materials (notably crystals and certain ceramics) to generate an electrical potential in response to applied mechanical stress. This may take the form of a separation of electric charge across the crystal lattice. If the material is not short circuited, the applied charge induces a voltage across the material. The word is derived from the Greek word piezien, which means to squeeze or press. The conversion of mechanical energy into electrical one is generally achieved by converters alternator type or commonly known dynamo. But there are other physical phenomena including piezoelectricity that can also convert mechanical movements into electricity. The phenomenon that produces an electric charge when a force is applied to piezoelectric material is known as the piezoelectric effect. The piezoelectric effect exists in two domains, the first is the direct piezoelectric effect that describes the material's ability to transform mechanical strain into electrical charge, the second form is the converse effect, which is the ability to convert an applied electrical potential into mechanical strain energy figure 1.1. The direct piezoelectric effect is responsible for the materials ability to function as a sensor and the converse piezoelectric effect is accountable for its ability to function as an actuator. A material is deemed piezoelectric when it has this ability to transform electrical energy into mechanical strain energy, and likewise transform mechanical strain energy into electrical charge. The piezoelectric materials that exist naturally as quartz were not interesting properties for the production of electricity, however artificial piezoelectric materials such as PZT (Lead Zirconate Titanate) present advantageous characteristics. Piezoelectric materials belong to a larger class of materials called ferroelectrics. One of the defining traits of a ferroelectric material is that the molecular structure is oriented such that the material exhibits a local charge separation, known as an electric dipole.

www.ijprems.com
editor@ijprems.com

INTERNATIONAL JOURNAL OF PROGRESSIVE RESEARCH IN ENGINEERING MANAGEMENT AND SCIENCE (IJPREMS)

Vol. 02, Issue 05, May 2022, pp : 380-381

e-ISSN : 2583-1062

Impact Factor : 2.205

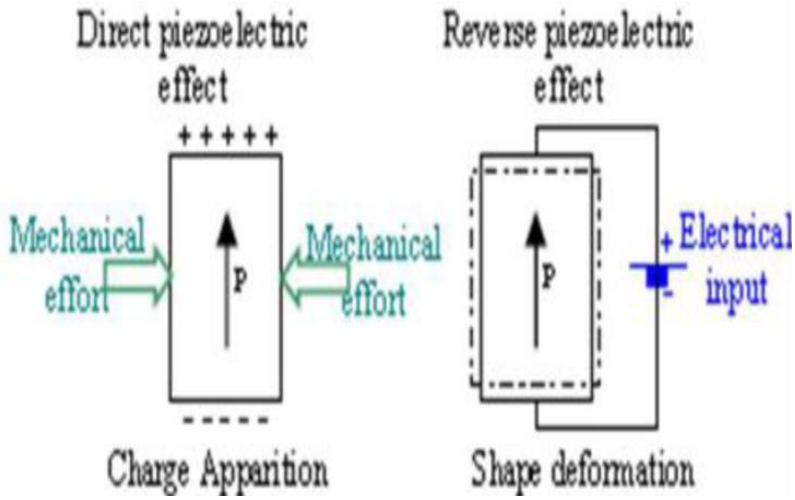
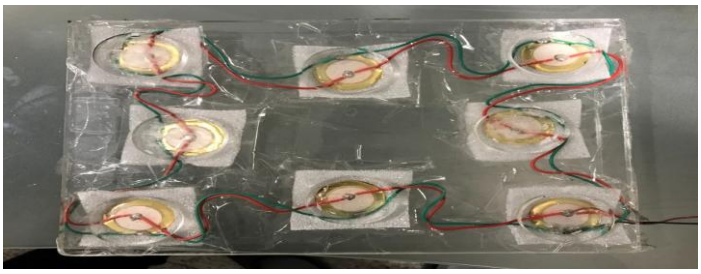


Fig1.1: Electromechanical conversion via piezoelectricity phenomenon

2. WORKING

Throughout the artificial piezoelectric material composition the electric dipoles are orientated randomly, but when a very strong electric field is applied, the electric dipoles reorient themselves relative to the electric field; this process is termed poling. Once the electric field is extinguished, the dipoles maintain their orientation and the material is then said to be poled. After the poling process is completed, the material will exhibit the piezoelectric effect.



3. CONCLUSION

A non-conventional, non-polluting form of energy can be harvested, maintaining the economic standards of common laymen. The electricity is produced from the mechanical stress on the crystals due to piezoelectric effect and thus it generates the energy needed for charging battery to light streetlights at night and also for the city consumption of electricity. Regardless of this project, the future of piezoelectric materials looks bright, with studies focusing on their properties and applications even in nanotechnology. If a compromise between the hardness of the road and the make-up of the small devices is reached, then undoubtedly the system will benefit both drivers and the national power grid. The assembly developed using series and parallel combination of piezo-crystals is very cost effective. A single crystal costs around 23 – 25 Rupees, and hence the cost of whole assembly is very less. It is very encouraging to get a good voltage and current at such a low cost at the same time utilizing the waste energy. So, the assembly improves on the concern of cost effectiveness to a great extent and the work is on to further improve upon the results of the system.

4. REFERENCES

[1] https://www.elprocus.com/footstep-power-generation-system/ Accessed 10/9/2018
[2] http://www.ijeit.com/Vol%203/Issue%2010/IJEIT1412201404_51.pdf Accessed 10/9/2018
[3] https://www.ijser.org/researchpaper/Footstep-Voltage-Generator-using-Piezo-Electric-Transducers.pdf Accessed 20/11/2018