International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

A Review on Smart Power Generation

Shivam Kumar[1], Om Ji Mishra[2], KM Anupama Prajapati[3], Arpit Kumar Tripathi[4], Deepti Ojha[5]

[1]Student, Institute of Technology and Management
[2,3,4]Institute of Technology and Management
[5]Head Of Electronics Department, Institute of Technology and Management

ABSTRACT

Since time immemorial, humans have been requiring and using energy at an increasing rate for their sustenance and well-being. Due to this a lot of energy resources have been exhausted and wasted. Currently we have a variety of power sources, both renewable and nonrenewable sources, but still we are unable to meet our electricity needs. An alternative ways to generate electricity by using piezoelectric sensor. When human walking, the vibration that generates between the surface and the footstep is wasted. Utilizing this wasted energy, the electrical energy can be generated and fulfill the demand of our electricity. A piezoelectric transducer is used to detect the vibration and this transducer converts the mechanical energy into electrical energy. When we applied a pressure to the piezoelectric transducer it will convert the pressure into electrical energy. The piezoelectric transducer is connected in series-parallel connection. This paper is all about generating electricity when people walk on the floor. This idea is used to convert the weight energy into the electrical energy. In these days energy crisis is the main issue in the world. The main motive of this research work is to reduce the electric crisis.

Keywords: Piezoelectric sensor, Power Generation, Power Source, Force, Electric crisis.

INTRODUCTION

As we all know that in our country the population increased and the requirement of the power is also increased. The wastage of energy also increased in many ways. So introducing this energy back to usable form is the major solution. The technology is developed and the use of gadgets, electronic devices also increased. Here are variety of ways to generate electricity power. A person's life walking is the most vital activity done by him. The walking weight is transferred to the road surface through foot falls on the ground at each step, person can loses his energy in the form of sound, throbbing, and impact. To overcome this problem, the energy wastage can be converted to usable form using the piezoelectric sensors. Sensor can convert the pressure into a voltage. By using this sensor we can generating the power. We use this project to generate a voltage using footstep fore. Given system can work as a medium to generate power using force. Our project is very useful in public place like bus stand, theaters', railway station, Mandir ect. We can place these systems where people walk and they have to travel on this system to get through the entrance or exits. These systems can generate the voltage on each and every step. We can use piezoelectric sensor to measure force, pressure and acceleration by its change into electric signal. We can use voltmeter for measuring output, LED lights, weight measurement

system and a battery for better demonstration of the system. In this project, we are saving natural energy resources.

LITERATURE REIVEW

The first demonstration of the piezoelectric effect was in 1880 by the brother Pierre Curie and Jacques Currie.[1] In 1980 US Army performed an experiment, this research proved that by changing the dimension and orientation of crystal the output. They designed the crystal named "Curie cut" or 'Zero Cut based on the changes made in the angles of the crystal. Design equations were derived and details of an operating device were studied.[2] Again in 2018 Gopinath, Lavanya, Arriva lagan have presented the model "Power Generating by Human Footstep using Piezoelectric Sensor on Treadmill" and their research have been published in Journal of Pure and Applied Mathematics Volume.[3] The Application of Piezoelectric Sensor as Energy Harvester from Small-scale was presented by Hidayatul Aini Zakaria and Chan Men Loon in 2018.[4] Piezo Gen – Approach to generate electricity from vibration was presented by Raghu Chandra, Dr. V.Shasrty.[5] All these above approach are for the generation of electricity from piezoelectric sensor. These approaches show different ways and ideas to use piezoelectric material to generate electricity. Some models use mechanical approach to fulfill their desired output and some used piezoelectric materials or sensor to generate electricity.

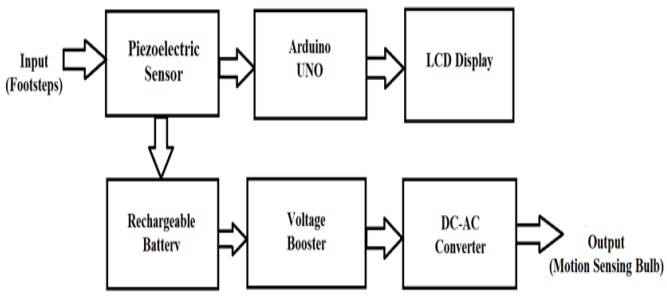
NEED OF THE SYSTEM

In that countries were the population is less, making use of waste energy generated by human motion is critical. The utilization of the waste energy foot power generation with human motion is very important in highly populated areas. India and China has large population, here in road, railway stations, temples, parks, and other public place are overcrowded as million of people walk around at all hours of day and night.

COMPONENTS USED

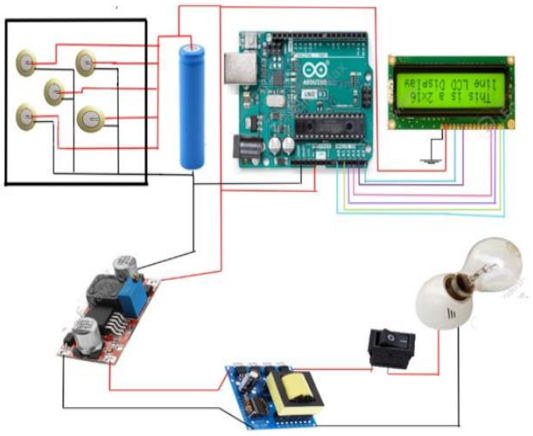
- Piezoelectric Sensor
- Rechargeable Battery
- Voltage Booster Module
- Arduino UNO
- LCD Display
- DC-AC Converter
- Bulb(Motion Detection)

SYSTEM DESIGN



Here we take input from the footstep and by piezoelectric effect of piezoelectric sensor, we are able to generate DC voltage and store it in rechargeable battery as well as we will monitor the produced voltage and count by the help of Arduino UNO and it will show it through LCD Display. After storing, we take voltage from rechargeable battery and passes its voltage through DC step up circuit (voltage booster). From the voltage booster we take the output of 12v DC and give it as a input to the DC-AC Converter. From the output of the converter, we use the AC current to give power supply to the Motion Sensing Bulb, which help in consuming energy. This model can be used in various aspects as like using all the electronic gadgets and appliances. This model can be very beneficial from future perspectives.

CIRCUIT DIAGRAM



ADVANTAGES

1. Renewable Energy Source
2. Energy Harvesting from High-Traffic Areas
3. Low Maintenances & Scalability
4. Emergency Power Generation
5. Public Awareness & Engagement
6. Potential for Integration with IOT

DISADVANTAGES

1. Low Power Output
2. Inconsistent Power Generation
3. Limited Energy Storage
4. Wear and Tear
5. Limited Scalability

FUTURE SCOPE

The future scope of footstep power generation using piezoelectric sensor holds considerable potential, as advancements in technology and a growing focus on sustainable and renewable energy sources are likely to overcome many of the current limitation. Piezoelectric sensors have being start better use with the positive result. India and china has maximum public movement is observed in railway station, airports, shopping malls etc. Hence this place can be used for piezoelectric sensor for generation of electric power. Apart from these we can develop energy from our daily life by initialing piezoelectric in shoes.

Thus, in each step piezoelectric crystal can be compressed which can turned enough power to charge a cell phone, mp3 player etc. Through this we can generate electric power and used that for small electronic gadgets.

CONCLUSION

Many countries are facing energy crisis where there is load shedding of electricity due to shortage of energy. This project is the best method of power generation and by increasing the size of footstep power generation system the production of electricity generation is increased. This technique for generation of power can be utilized where accessibility of power is less or exceptionally low. Using this project, we can convert A.C and D.C drives based on the force we apply. A piezoelectric tiles is capable of generating more voltage when longer time taken. The longer time taken means more footsteps are applied on the tiles. The power that is generated from this piezoelectric tile can be used to power up the light street, light along the stairs and also low power appliances.

References

1. https://www.researchgate.net/publication/347221538_A_Comprehensive_Review_of_Recent_Advances_in_Smart_Grids_A_Sustainable_Future_with_Renewable_Energy_Resources
2. https://www.researchgate.net/publication/336041776_Piezoelectricity_a_literature_review_for_power_generation_support
3. https://www.researchgate.net/publication/362815306_Foot_step_power_generation_using_piezoelectric_sensors
4. https://www.irjmets.com/uploadedfiles/paper/issue_3_march_2022/20184/final/fin_irjmets1648274394.pdf
5. https://ijrpr.com/uploads/V4ISSUE5/IJRPR12957.pdf
6. https://www.pramanaresearch.org/gallery/prj-p1058.pdf
7. https://www.jetir.org/papers/JETIRFP06111.pdf
8. https://www.ijraset.com/research-paper/footstep-power-generation-using-piezoelectric-sensor
9. https://www.irjmets.com/uploadedfiles/paper//issue_4_april_2023/35544/final/fin_irjmets1681820885.pdf