

# ADVANCED FOOT STEP POWER GENERATION USING PIEZOELECTRIC SENSORS

<sup>1</sup>Dr.Saju Simon S. G, <sup>2</sup>Manikandan R, <sup>3</sup>Priyanka S, <sup>4</sup>Ranjith Kumar.S

<sup>1</sup>Head & Assistant professor, Department of Biomedical Engineering,

<sup>2</sup>UG Scholar, <sup>3</sup>UG Scholar, <sup>4</sup>UG Scholar

<sup>2,3,4</sup>Department of Electronics and Communication Engineering,  
Muthayammal Engineering College, Namakkal, Tamil Nadu, India.

**Abstract---**The reducing in energy consumption of portable electronic devices, the concept of gathering renewable energy in human surrounding arouses a renewed interest. This paper focuses on one such a new way of energy harvesting using piezoelectric sensors. Piezoelectric sensors can be used as mechanisms to transfer mechanical energy like vibration, into electrical energy that can be stored and used to power other devices. Piezoelectric sensors have a more application in real life. Some of the new applications are mentioned by the following steps. Nowadays, there is a need to utilize different forms of energy at passenger terminals like railways and airports across the world. Cleaner, more sustainable forms of electrical power are needed in order to keep costs lower, to maintain productive and positive relationships with neighbors and to insure a healthy environment for upcoming future generations. The use of piezoelectric devices are installed in terminals will enable the take of kinetic energy from foot traffic. This energy can be used to offset some of power can be used to operating the lighting systems. These devices are used in a huge number of comforts in our daily lives. With the increase in energy consumption of these portable electronic devices, the concept of gathering alternative renewable energy in human surroundings arise a new interest among us. In this paper we try to develop a new piezoelectric energy generator. That can produce energy from pressure and vibration available on some other term (like people walking). This project describes piezoelectric materials uses in order to produce energy from people walking vibration for generating and accumulating the energy. This concept is also applicable to some large vibration sources which can find from the nature. This system also represents a footstep of piezoelectric energy harvesting model which is cost effective and easy to implement.

**Index Terms----** Foot step, Power Generation, Controller, Conversion, Piezo electric method.

## I. INTRODUCTION

An alternate method to produce electricity there are number of methods by which electricity can be produced, out if such methods footstep energy production can be an effective method to generate the electricity. Walking is the common activity in human life. When a person walks, he loses some energy to the road surface in the form of impact, vibration, sound etc, due to the transfer of his weight on to the road or path surface, through foot falls on the ground during every step. This energy can be tapped and converted in the usable form [1] (electrical form). This device, if embedded in the footpath, can convert foot impact energy into electrical form of energy. 95% of the exertion put into pedal power is converted into electrical energy. Pedal power can be applied to a wide range of jobs and it is a convenient, simple and cheap source of energy [8]. However, the human kinetic energy can be useful in a different ways but it can also be used to generate electricity based on different approaches and many industries and organizations are already implementing the human powered technologies to generate electricity to power small electronic appliances or things. The proposal for the utilization of waste energy of foot power [2], with human locomotion is very much relevant and important for highly populated countries like China and India where the mobility of its masses will turn into boon in producing electricity from its footsteps. In India, places like railway stations, roads and bus stands are all over crowded. As a result large amount of power can be obtained with the use of this promising technology. This method process involves number of simple setup that is installed under the walking platform. When the people walk on this platform their body weight compresses [7], the setup which rotates a dynamo or Sanyo coil and current produced is stored in the dry battery. To reduce the external compression, a responsive sub - flooring system is installed. And while the power producing platform is over crowded with moving population, energy is produced at huge levels. More movement of people will generate more energy. In this topic we are generating electrical power as non conventional method by simply walking or running on the foot step. Non conventional energy system is very essential at this time to our nation.

## II. PROPOSED SYSTEM

The proposed system is focusing to generate the energy using Piezo electric method and store the generated energy in batteries, and it we can be used during our usage. This proposed system is created using a microcontroller based. The sensors are placed in such an arrangement, so as to generate maximum output voltage. This is then provided to our monitoring circuitry. We also know the monitoring circuit is a microcontroller based that allows the user to monitor the voltage generated and this voltage is given to a rechargeable battery and here the energy was stored. This system also displays the total stored energy details using LCD display.

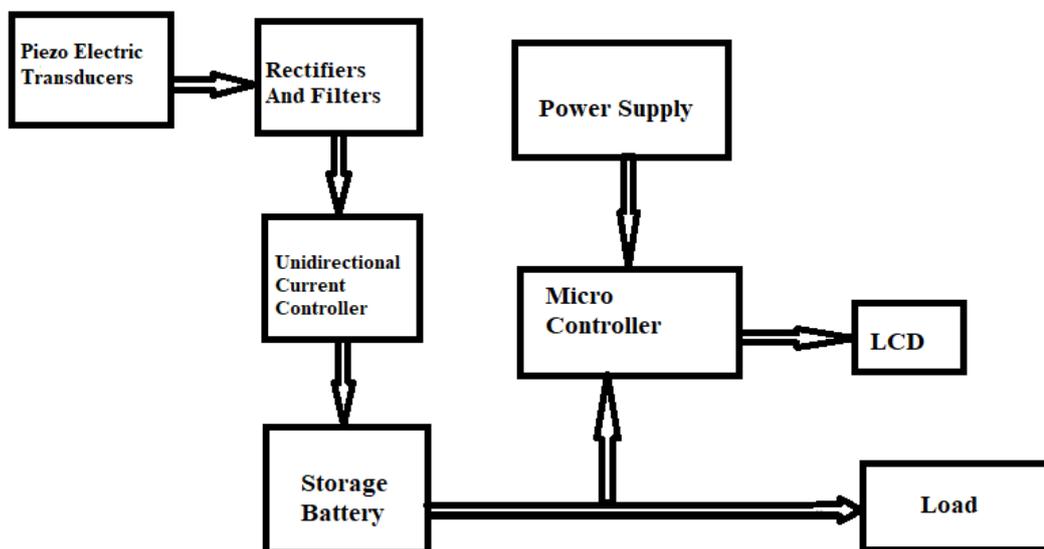


Figure 1: Block Diagram for Footsteps Energy generation

### III. CIRCUIT DIAGRAM

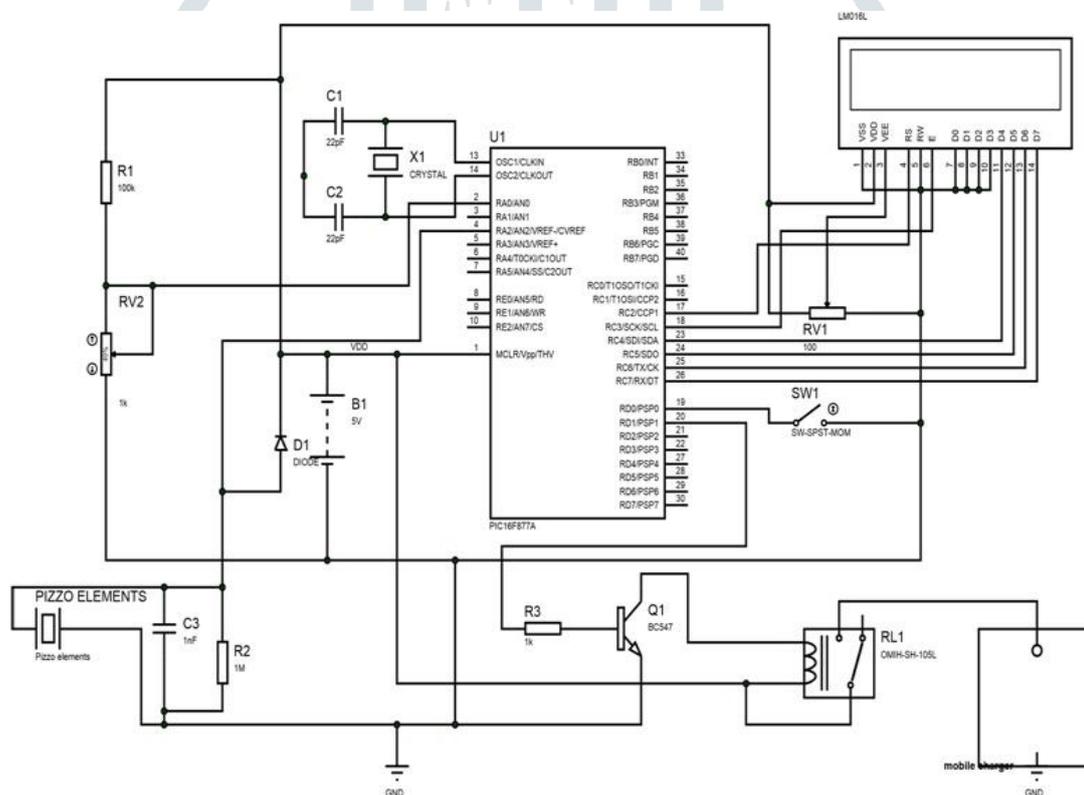


Figure 2: Circuit diagram for foot step energy generation

### IV. SYSTEM DESCRIPTION AND WORKING

This system has the basic principle of working is based on the piezoelectric sensor. To implement this system we have to adjust the wooden plates above and below the sensors and moveable springs [5]. Non-conventional energy using foot step is converting mechanical energy into the electrical energy. Foot step board it consist of a sixteen piezoelectric sensors which are connected in parallel [6]. When the pressure is applied on the piezoelectric sensors, the piezoelectric sensors will convert mechanical energy into electrical energy. This electrical energy will be storing in the rechargeable battery connected to inverter. We are using conventional battery charging unit also for giving supply to the circuitry. This inverter is used to convert the 12 Volt D.C to the 230 Volt A.C [4]. This 230 Volt A.C voltage is used to activate the loads. By using this AC voltage we can operate AC loads.

### V. ADVANTAGES

This foot step energy generating system contains following advantages, there are

- No need of fuel input.

- This is non-conventional system.
- Power generation is simply walking on the step.
- It is Reliable, Economical, and Eco-Friendly.

## VI. APPLICATIONS

This system has more applications like this can be used in very populated places such as,

- Schools
- Working Industries
- Colleges
- Cinema Theatres
- Shopping Complex
- Air ports
- Bus and Railway Stations

## VII. FUTURES

Utilization of wasted energy is very much relevant and important for more populated countries (like India and China) in future.

In future aspects we can use this principal in the speed breakers at high ways where are rushes of the vehicles too much thus increases input torque and ultimate output of generator [9], If we are used this principle at very busy stairs palace then we produce efficient useful electrical for large purposes

Flooring Tiles in Japan, Japan has already started and experimenting the use of piezoelectric effect based on energy generation [3]. They implement piezoelectric effect on the stairs of the bus. Thus every time passenger steps on the tiles; they trigger a small vibration that can be stored as energy. The flooring tiles are made up of rubber which can absorb the vibration. This vibration generates when running or walking on it. Under these tiles piezoelectric material are placed. When the movement is felt by the material they can generate the electricity. This generated energy is simultaneously stored into the battery. Generated electricity we can use the lightning of lamp or street light. Energy is generated by step of one human being is too less but if number of steps increases ultimately energy production also increases

Dance floors in Europe, Europe is another one of the country which started experimenting use of piezoelectric crystal for energy generation [3], in night clubs. Floor is compressed by the dancer's feet and piezoelectric materials makes contact and generate electricity. Generated electricity is nothing but 2- 20 watt [10]. It depends on impact of the dancer's feet.

## VIII. RESULT AND DISCUSSIONS

### SIMULATION

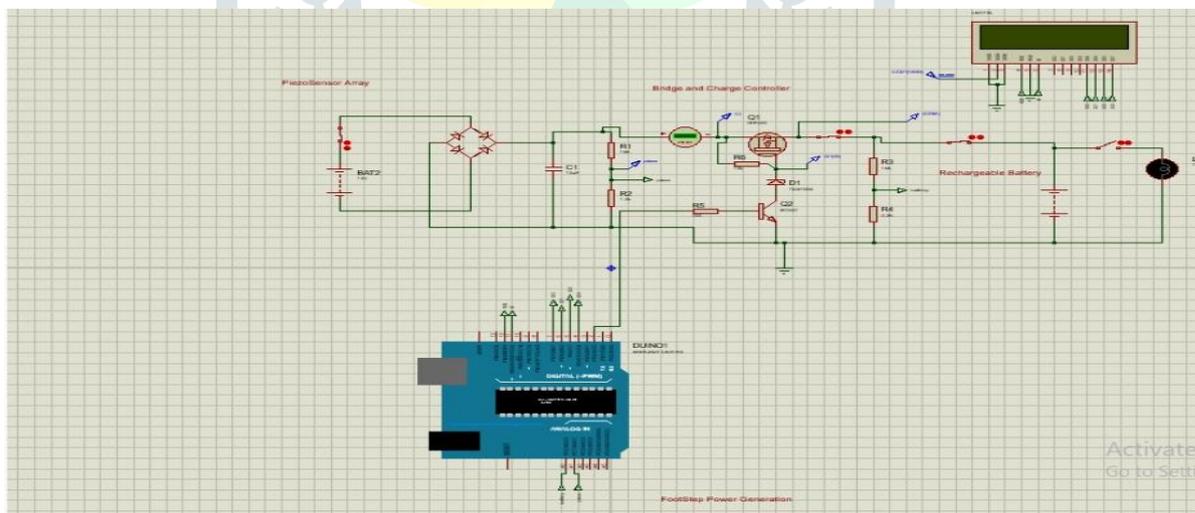


Figure 3: Simulation Diagram

As we take the average value of the voltage and current generated by piezoelectric sensors, then we try to find out the total production or generated power.

We assume the 200 footsteps push the plate of piezo electric transducer in 2 hour then the current produced by using this system we can drive both A.C. as well as D.C loads according to the force we applied on the piezo electric sensor is Produce 4000 watts of electricity.

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

## IX. CONCLUSION

The developments in piezoelectric materials or devices are giving new ways of building the materials themselves, and integrating them into silicon systems provides even more opportunities to supply power where it is needed. As the power consumption of processors and wireless transceivers falls with the current new silicon technology, so the energy produced by vibration energy produce can be used more effectively. Coupled with re-chargeable batteries and low-power DC-DC converters, the new piezoelectric materials can provide the power needed for portable and industrial applications with higher power outputs and increasing efficiency. The vibration technology is also opening up new applications in transportation, particularly with the road systems to provide the power for signs and traffic lights, reducing the cost of installing and managing telemetric networks with dramatically long, maintenance-free design lives.

This method for generation of power is extremely prudent and is anything but easy to produce. It can be utilized as a part of rural zones additionally where accessibility of power is less or exceptionally low. It can be utilized to drive both AC and in addition DC load. In developing nation like India we can utilize this strategy for power generation with a specific end goal to uncover the heaps from Renewable and non-Renewable wellspring of energy.

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