

# GENERATION OF ELECTRIC POWER USING FOOTSTEP

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**Abstract**—These days Men have been exhausting natural energy resources for way too long and too fast. Pollution and overuse of them has caused a lot of disruptions in nature. Hence it is required to shift to a clean energy generation process and generation of electricity from footsteps is a relevant idea in such a scenario. A Nation's development depends upon its ability to produce energy at low cost and with less pollution. There is no pollution caused by producing electricity in this method. In this project, the pathways are mounted by piezoelectric sensors which converts the kinetic energy exhausted by pedestrians into electrical energy. Using a battery, the produced electricity is stored and connection is given to a bulb. Establishing such a pathway in highly populated regions can produce abundant energy which can be stored and used for later purposes such as street lights, fans etc... Such a system is highly beneficial in countries like India where crowded streets are common.

**Index Terms**—Piezoelectric sensor, Battery, Picopower ATMEGA 328P microcontroller, LCD display

## I. INTRODUCTION

THIS World is developing rapidly with new technologies and as a result the demand for energy is skyrocketing. As a result, the fossil fuel which has been the backbone of energy production is depleting very fast. For decades we have been depending on the fossil fuels whose availability is decreasing in a concerning manner which will soon put an end to the use of nonrenewable energy. Lion share of industries work on fossil fuels such as petrol, diesel, coal and natural gas which has undoubtedly contributed to the pollution of nature

including the air we breathe and global warming. Yet, people keep on using them because of its easy availability for now. Lot of statistics state that the fossil fuel will be completely exhausted within 100 years, but more importantly if we keep on using the world will be polluted irreversibly. Hence even before these non-renewable energy sources cease to exist it is our responsibility as a developing world to shift from non-renewable to renewable energy sources. Countries such as Germany and Denmark have completely shifted to renewable energy sources which shows the development, they have achieved in areas of energy management. The main advantages of renewable energy sources such as wind, solar energy, tidal energy is that the impact on nature is very less and we are utilizing energy which otherwise would have gone waste. By doing so the carbon emission from burning of fossil fuels is reduced dramatically by which we can tame global warming which a rising concern right now. The need to implement clean energy production is of high demand in present scenario. Even then complete implementation of renewable energy is not possible in India since its geography varies from state to state and its less efficient, costly to install and storage of energy is difficult. Moreover, a developing country like India need clean and economic energy production method since half of its population still cannot afford electricity. So, the focus must be on clean as well as economic energy production and that is what intended on this project. In this project, energy is produced using piezoelectric sensors which works on piezoelectric effect. The piezoelectric effect is the conversion of mechanical energy like stress, pressure, strain etc. into electrical energy. These sensors harness the energy exhausted by people on walking which goes waste into electrical energy which can be stored in a battery and later used as an energy source for street lights, fans, bulbs etc. This is a very cost-

effective approach which can be implemented anywhere where it is crowded and energy can be harvested without any complex procedure. Implementing piezoelectric sensor mounted floors is undoubtedly beneficial for countries like India and China where population is very high and crowded areas are common. Such a system can be introduced in railway stations, temples where people are always present. Whenever a pressure is applied on the sensor electricity will be generated according to the amount of pressure and is stored in a battery. Such a system will be economic in crowded areas. If proper measures are taken even our roads can be paved by piezoelectric tiles and harvest energy from the moving vehicles. Since the production cost is very less this kind of energy generation will be able to reach millions of people across the under developed regions and will also stabilize the country in energy production. Another advantage of this approach is that unlike other energy plants we are not harming any ecosystem. Hence energy harvest from human locomotion is a very important area to be researched and worked on.

## II. OBJECTIVE

The Objective of the mentioned project is given as follows :

- Utilization of waste energy of foot power with Human Locomotion
- To Create a system that generates electrical power using human footstep in Commercial and Crowded Places at a comparatively lower price
- To promote the non-conventional source of energy
- To save conventional source of energy

## III. WORKING METHODOLOGY

The footstep arrangement is used to generate the electric power. This arrangement is used to generate electric power in order to compensate the increasing demand of electricity. In this method, the pressure of the human footstep is sensed by the sensor is converted into electrical power. That is, the Mechanical Energy is converted into Electrical Energy.

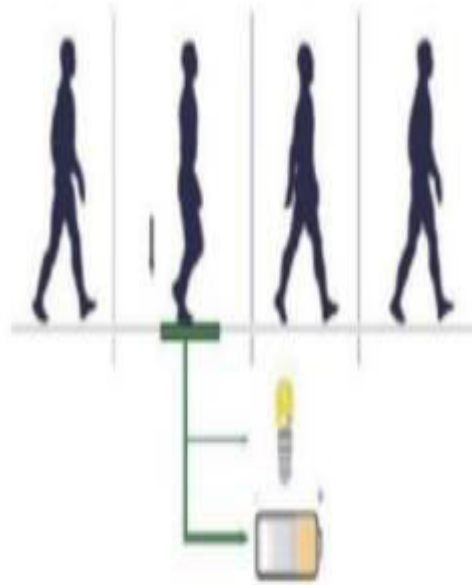


Fig.1 schematic representation of the system

## IV. PROPOSED SYSTEM

The Basic working principle of the project is to produce electric energy from the waste energy of footstep using piezo electric sensors. This electrical energy will be stored in the 12V rechargeable battery connected to inverter.

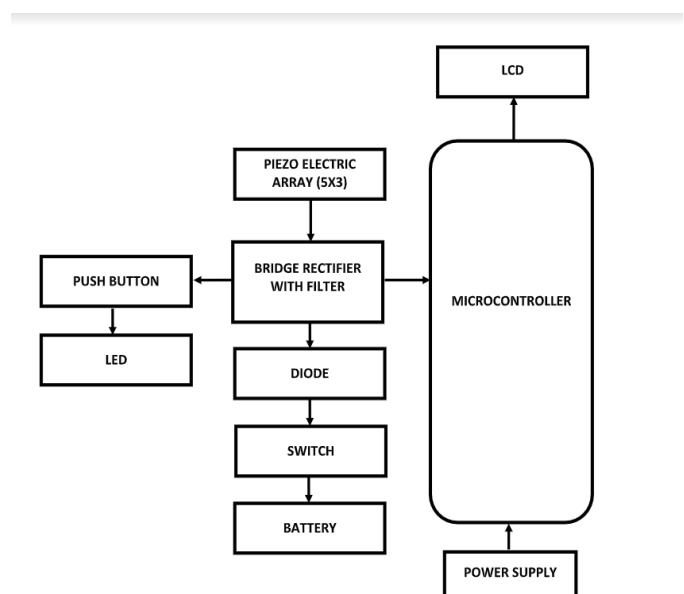


Fig.2.Experimental Setup

## V. WORKING PRINCIPLE

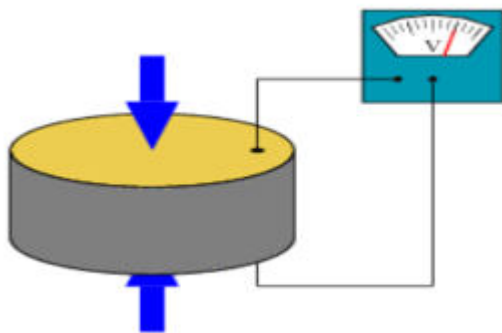
The piezo mat converts the mechanical energy into electrical energy. The pressure is applied in the form of human locomotion. Whenever the person walks through the mat, certain amount of pressure is applied on the sensor, these pressure is converted into electric power with the help of piezoelectric sensor and is saved to Battery. Since the output of the piezo electric is unstable, it is given to a rectifier circuit. The AC Voltage obtained from the piezo electric sensor is converted into DC using a DC to DC Converter in order to avoid the fluctuations. Since the voltage obtained from a single piezo sensor is less, several piezo electric sensors are connected in series-parallel connection as it produces a comparatively large amount of voltage. A 16 X 2 LCD is connected to know the amount of voltage produced. For this purpose, an Arduino microcontroller is used. The Output of the microcontroller is given to the LCD to display the voltage levels. The amount of energy stored in the battery can be monitored and controlled by the microcontroller. The Electric power stored in the battery can be further used for purposes such as Street lights, for charging phones and for all commercial and domestic purpose.

## VI. HARDWARE DESCRIPTION

The hardware components used in the projects are described below.

### A. Piezo Electric Sensors

A **piezoelectric sensor** is a device that uses the piezoelectric effect to measure changes in pressure, strength, force, acceleration, temperature, strain, or by converting them to an electrical charge. A piezoelectric transducer has very high DC output impedance and can be modeled as a proportional voltage source and filter network. The voltage  $V$  at the source is directly proportional to the applied force, pressure, or strain.<sup>[7]</sup> The output signal is then related to this mechanical force as if it had passed through the equivalent circuit.



### B. Inverter

An inverter is an electrical device that converts direct current (DC) to alternating current (AC); the converted AC can be at any required voltage and frequency with the use of appropriate transformers, switching, and control.



C. Arduino Uno is a microcontroller

board based on the ATmega328P (datasheet). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz ceramic resonator (CSTCE16M0V53-R0), a USB connection, a power jack, an ICSP header and a reset button.



### D. LCD Display

A **16x2 LCD display** is very basic module and is very commonly used in various devices and circuits. A **16x2 LCD** means it can **display** 16 characters per line and there are 2 such lines. In this **LCD** each character is displayed in 5x7 pixel matrix. ... This **LCD** has two registers, namely, Command and Data.



### E. Rectifier Circuit

A rectifier is an electrical device that converts alternating current, which periodically reverses direction, to direct current, which flows in only one direction. The reverse operation is performed by the inverter.

### F. DC to DC Converter

A **DC-to-DC converter** is an electronic circuit or electromechanical device that converts a source of direct current (DC) from one voltage level to another. It is a type of electric power converter. Power levels range from very low (small batteries) to very high (high-voltage power transmission).

### G. Power Supply

A **power supply** is an electrical device that supplies electric power to an electrical load. The primary function of a power supply is to convert electric current from a source to the correct voltage, current, and frequency to power the load.

## VII. CONCLUSION

The Energy obtained from the device is a non-conventional source of energy that has more advantage over the energy that exists already. Maximum of 40V current is obtained when the piezo electric sensors are connected in series-parallel once when the pressure is applied. Since the output of the piezo electric sensor is AC, it is rectified. The system uses only 10% of renewable energy as the primary energy. Implementation of these systems in crowded places helps in obtaining more amount of non-conventional source of energy which helps in overcoming the energy crisis that the world is facing currently.

## VIII. FUTURE SCOPE

In Future, these Tiles can be installed in roads, where the input pressure on the piezo electric sensor will be given in the

form of movement of vehicles. The Installations of such mat in commercial places such as malls will provide them the necessary power to light up the lights. The future advancement in the field of electronics, in synthetization of the piezo electric sensor and components can result in large production of electricity. The energy crisis can be completely avoided if such systems are installed in all crowded places.

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