

# Foot Step Power Generation using Piezoelectric Sensor

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**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. In this project 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. Non-conventional energy using foot step is converting mechanical energy into the electrical energy. This project uses piezoelectric sensor.

**Keywords:** Piezoelectric Sensors, Battery, Electricity and Footstep Power Generation

## I. INTRODUCTION

Populated countries in INDIA and CHINA, where the roads, railway stations, bus stands and temples are overcrowded and millions of people moving around the clock. By using such principle the energy can be utilized in the whole area where the mechanical energy is being converted to electrical energy.

In the world of modern technology, newer sources of energy and new methods of power generation are two important area of interest for researchers and engineers. Recently a new method is established to generate power from the lost energy of a human during his/her locomotive period.

### A. System Block Diagram

Following figure shows the system block diagram of the foot step power generation by using piezoelectric sensor.

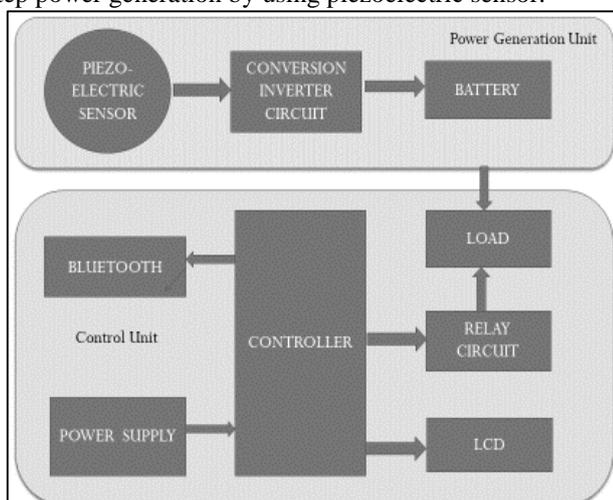


Fig. 1: System Block Diagram

From this figure suppose this is a whole system of foot step power generation, it includes the power generation unit and control Unit.

In day today life the utilization of power turns to be necessary for each work .The power delivered in this paper will not contaminate the surroundings and it is also will not to rely upon the climate conditions. The paper proposes a novel technique for the creation of power utilizing piezoelectric sensors kept along the footpaths which can ready to charge the battery and ready to supply the force at whatever time of our prerequisite. The footstep power generation technique through piezoelectric sensors produces electrical force by changing mechanical energy of the development of individuals on the floor to electrical energy. The benefits of piezoelectric force generation framework is that it is sheltered and secure to utilize, it doesn't make any issue or distress for the general population strolling through footpath, and it is absolutely chance free strategy. Footstep power generation technique has mechanical part and in addition electrical part, however the electrical and mechanical losses are negligible. This framework additionally has the ability to store the electrical force away battery.

## II. PROBLEM STATEMENT

To overcome the problem mentioned below the foot step power generation by piezoelectric sensor system is useful.

- In Pakistan the demand is more than the daily energy produced so we are facing power-cut after approximate 1 hour and industries are in hell these days.
- People uses rechargeable batteries (UPS) or diesel/petrol engine to fulfill their demands.
- The use of stand by generator is common in industries and large offices.

## III. PROPOSED SYSTEM

When the piezoelectric sensor is stressed it produces the variable DC voltage it is converted into pure DC voltage by using rectifier.

Following figure shows the block diagram of control unit of foot step power generation system.

### A. Control Unit:

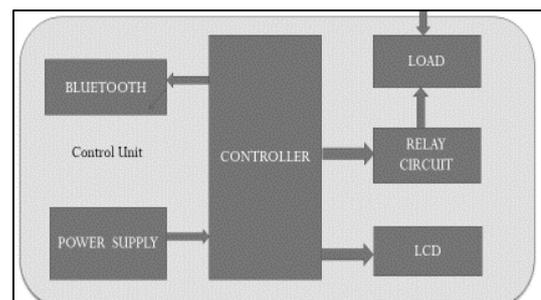


Fig. 2: Control Unit

## B. Power Unit:

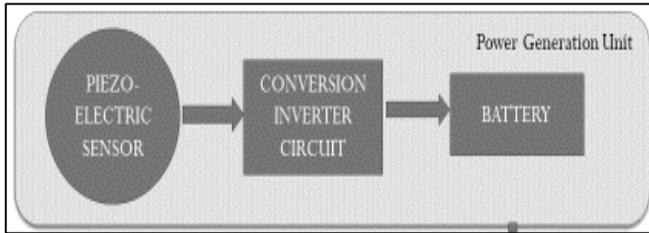


Fig. 2: Power Unit

### 1) Piezoelectric Sensor:

A piezoelectric sensor is a device that uses the piezoelectric effect to measure pressure, acceleration, strain or force by converting them to an electrical signal

#### a) Features of Piezoelectric Sensor:

- Piezoelectric material consists of polarized ions within the crystal.
- A piezoelectric sensor applies pressure on the piezoelectric crystal in proportion to the charge output. The resultant displacement in the ions within the crystal position is measured and recorded using piezoelectric vibration sensors.
- A piezoelectric accelerometer has a charge frequency response capacity ranging from Hz to 10 KHz.
- A piezoelectric accelerometer can have electromagnetic sensitivity of 0.0009 equiv.gm/gm and base strain sensitivity of 0.008 equiv.gm/micro strain. Piezoelectric force sensors should display a 5-volt full display signal.

#### b) Battery:

- Battery (electricity), an array of electrochemical cells for electricity storage, either individually linked or individually linked and housed in a single unit.
- Li-ion batteries use an intercalated lithium compound as one electrode material, compared to the metallic lithium used in a non-rechargeable lithium battery.
- Lithium-ion batteries are common rechargeable batteries for portable electronics, with a high energy density, tiny memory effect and low self-discharge. LIBs are also growing in popularity for military, battery electric vehicle and aerospace applications.

#### c) Voltage Regulator:

- In this project, power supply of 5V and 12V are required. The first number 78 represents positive supply and the numbers 05, 12 represent the required output voltage levels.
- These regulators can provide local on-card regulation, eliminating the distribution problems associated with single point regulation.

#### d) 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 circuits.
- Inverters are commonly used to supply AC power from DC sources such as solar panels or batteries. It is simple and low cost and is compatible with most electronic devices
- It is so named because early mechanical AC to DC converters was made to work in reverse, and thus were

"inverted", to convert DC to AC. The inverter performs the opposite function of a rectifier.

- The electrical inverter is a high-power electronic oscillator.
- e) Arduino Hardware:
  - Arduino is open-source hardware.
  - Arduino microcontrollers are pre-programmed with a boot loader that simplifies uploading of programs to the on-chip flash memory.
  - The Arduino board exposes most of the microcontroller's I/O pins for use by other circuits.

## IV. CONCLUSION

The project "POWER GENERATION USING FOOT STEP" is successfully tested and implemented which is the best economical, affordable energy solution to common people. This can be used for many applications in rural areas where power availability is less or totally absence As India is a developing country where energy management is a big challenge for huge population. By using this project we can drive both A.C. as well as D.C loads according to the force we applied on the piezo electric sensor.

A piezo tile capable of generating 40V has been devised. Comparison between various piezo electric material shows that PZT is superior in characteristics. Also, by comparison it was found that series- parallel combination connection is more suitable. The weight applied on the tile and corresponding voltage generated is studied and they are found to have linear relation. It is especially suited for implementation in crowded areas. This can be used in street lighting without use of long power lines. It can also be used as charging ports, lighting of pavement side buildings. As a fact only 11% of renewable energy contributes to our primary energy. If this project is deployed then not only we can overcome the energy crises problem but this also contributes to create a healthy global environmental change.

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