



# Foot Step Power Generation Using Piezoelectric Sensor

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## ABSTRACT

Power crisis is one of the biggest problems in the world. As the usage of power increases day by day and the power generating through the regular methods is not sufficient for the present generation. It's very important to generate power using different methods. In our day to day life the energy generated by the humans while walking is getting wasted. To overcome the power crisis the energy wasted through human is utilized. During walking or jogging on piezoelectric plates. Here when the pressure is applied on piezoelectric plates it converts mechanical energy or energy generated through stress to electrical energy. Hence here the procedure used to generate electrical energy doesn't contaminates the surroundings and it is pollution free. The set up of piezoelectric plates is easy. The generated electricity is used for small power applications like street lightning and battery charging. The power generation using foot step can be effectively implemented inschools, colleges, cinema theaters, shopping complexes and many other buildings. We can generate 1mw of power if we have 100 floors, as we are able to model a power production floor which can generate 1000 watts on just twelve footsteps.

**Keywords—Piezoelectric plates, Foot step, Powergeneration, force and pressure.**

## 1. INTRODUCTION

Day by day, the population of the country increased and the requirement of the power is also increased. At the same time the wastage of energy also increased in many ways. So reforming this energy back to usable form is the major solution. As technology is developed and the use of gadgets, electronic devices also increased. Power generation using conservative methods becoming deficient.

There is a necessity arises for a different power generation method. At the same time the energy is wasted due to human locomotion and many ways. To overcome this problem, the energy wastage can be converted to usable form using the piezoelectric sensor. This sensor converts the pressure on it to a voltage. So by using this energy saving method that is the footstep power generation system we are generating power. This project is used to generate voltage using footstep force.

The proposed system works as a medium to generate power using force. This project is very useful in public places like bus stands, theaters, railway stations, shopping malls, etc. So, these systems are placed in public places where people walk and they have to travel on this system to get through the entrance or exists. Then, these systems may generate voltage on each and every step of a foot. For this purpose, piezoelectric sensor is used in order to measure force, pressure and acceleration by its change into electric signals.



This system uses voltmeter for measuring output, LED lights, weight measurement system and a battery for better demonstration of the system. In another way, we are also saving natural energy.

## **2. LITERATURE REVIEW**

Earlier developments in the piezo electric circuitry involved concentration on small vibrations and hence small strains. Also, few of them required external voltage supply and there were number of losses in the system which amounts to low voltage output.

In December 1929, scientists in U.S Navy performed various researches on piezoelectric crystals. Their focus was primary on the dimensions of crystals. This research proved that by changing the dimension and orientation of crystal the output. considerably changed. They designed the crystal named "Curie cut" or "Zero Cut based on the changes made in the angles of the crystal. Thus, this proves that the crystals designed with such dimensions are effective in controlling oscillations of a 50watt vacuum tube. So, they act as a voltage controlling device too.

In 1985, the concept of using handwriting dynamics for electronic identification was performed in Sandia Laboratories A piezoelectric sensor pen for obtaining the pen point dynamics during writing was studied.

Design equations were derived and details of an operating device were studied. Typical output waveforms obtained from the operation of the pen and showed the dissimilarities between dynamics of a genuine signature and an attempted forgery. So, this also shows high sensitivity of Piezo material towards marginal pressure change.

In 2000, various applications of piezoelectric in wireless sensing was studied and experimented. Numerous industrial and military applications require remote sensing of various machine and equipment operating parameters in locations where traditional power sources may not be available and long periods of unattended operation are required. Quite often, however, some source of Vibrating energy may be present in operation of the machine in question. Hence a piezoelectric source is efficiently utilized to generate power for the operation of a microcontroller and radio transmitter acquire sampled machine data.

Various techniques for the efficient conversion, use and storage of piezoelectric power are discovered and used in a general energy harvesting data transmitter design. In 2005. United States Defence Advance Research Project Agency (DARPA) initiated an innovative project on Energy harvesting which attempts to power battlefield equipment by 19 piezoelectric generators embedded in soldiers' boots. However, these energy harvesting sources put an impact on the body. DARPA's effort to harness 1-2 watts from continuous shoe impact while walking was abandoned due to the discomfort from the additional energy expended by a person wearing the shoes.

In this project the concentration is mainly on use of the piezoelectric crystals and films in high vibration system with efficient arrangement to get higher efficiency, amplification level designed will be such that the output rating of system will be considerably higher than previous system in efficiency.

### 3. PROPOSED SYSTEM

From time immemorial, human powered transport has been in existence in forms like running, walking etc. machines led to the enhanced use of human power in an efficient manner. Energy of human locomotion can be converted to electrical energy with the help of promising technologies. In this system, there is a sub flooring block of piezo electric crystals, which imparts an electrical current when people walk across it. The pressure polarizes the crystal there by separating the centers of positive and negative charges. Application of voltage on the crystal produces mechanical distortion of the material. Direct piezo electric effect, which is the phenomenon of generation of voltage under mechanical stress is employed in the system. The application of mechanical stress produces an electric polarization which is proportional to the stress. If the crystal is short circuited, flow of charge can be observed during loading.

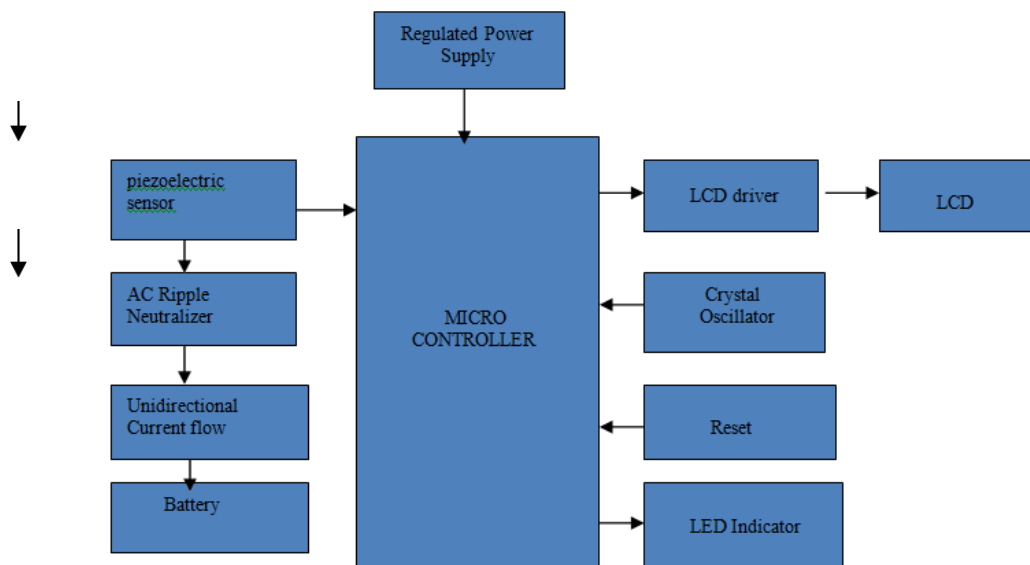


Fig: Block diagram

### 4. WORKING

Initially the regulated power supply is given to the microcontroller. Pressure is applied on the piezoelectric sensor. When the pressure is applied it converts mechanical energy to electrical energy.

When the electrical energy is generated it is passed to microcontroller and AC ripple neutralizer. Here AC ripple neutralizer removes the ripple content and microcontroller controls the generated fluctuations in generated voltage.

After the AC ripple neutralizer the generated voltage passes to the unidirectional current flow which makes current to flow in the single direction. Furtherly the obtained current makes the battery charge.

The output of the microcontroller is given as input to the LED driver which converts the high voltage alternating current into low voltage direct current and furtherly the obtained direct current is given to LCD that displays the obtained DC voltage.

Crystal oscillator, Reset and LED indicator are connected to the microcontroller. Here crystal oscillator works opposite to piezoelectric effect, Reset is used to perform reset operation and with the obtained voltage

the LED bulb glows.

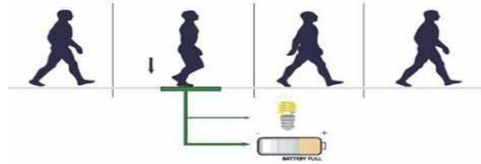


Fig : working of foot step power generation.

## 5. FUTURE SCOPE

The piezoelectric crystals have being start better use with the positive result. In china and Japan, maximum public movement is observed in railway station, airports and shopping malls. Hence this place can be used for piezoelectric crystals for generation of electric power. Apart from all the above places attempts are made to 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.



Fig : Actual view of project.

## CONCLUSION

In this project we have calculated the various methodologies for foot step generation using piezoelectric sensors. The Experimental setup is discussed with all sub equipments. The results have been discussed in terms of output voltages. The plot between weight and power shows the extent of power generated. The various merits are power generation just by walking on the step and no need of fuel, power may also be generated by running or exercising on the step and battery may be used to store the conventional power. In future works one may attempt to overcome following limiting factors as it is only applicable for the particular place and limited power is generated using the conventional ICs present in market. In future we may implement the same methodology in treadmills, staircases and places with frequent human moment with their commercial usage model

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