



**IJIRCCCE**

e-ISSN: 2320-9801 | p-ISSN: 2320-9798



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

Volume 8, Issue 8, August 2020

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

**Impact Factor: 7.488**

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# Footstep power Generator using piezoelectric Material

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**ABSTRACT:** Nowadays energy and power are the one of the basic necessities regarding for this modern world. As the demand of energy is increasing day by day, so the ultimate solution to deal with these sorts of problems is just to implement the renewable sources of energy. But these renewable energy sources must have to be adopted in practical manner by keeping an eye on all aspects regarding the research work. So then these techniques should be applied in order to get the desired output. In case of our project we have used the technique of power generation through footsteps as a source of renewable energy that we can obtained while walking on to the certain arrangements like footpaths, stairs, platforms and these systems can be install elsewhere specially in the dense populated areas. The basic principle of piezoelectric power generator is based on piezoelectric sensor. In order to implement it, we adjust the wooden or plastic plate above and below, so that when we walk through it, the force applied to and as a result magnet fixed under the top wooden sheet and moves into the cavity. As this cavity is fixed at bottom wooden or plastic sheet of mat so between the moveable springs adjusted between the top and bottom sheets. The voltage regulator used to regulate the battery voltage. Then battery should be stored the electrical energy and will be displayed in LCD the load will be controlled in microcontroller. In this project we are generating electrical energy by means of a non-conventional method just by walking on the footsteps. Non-conventionalsystems for energies are very much required at this time. Energy generationusing footsteps requires no any fuel input to generate electricity. In thisproject we are generating electricity just with the help of rack and pinionarrangement along with alternator and chain drive mechanism.

## I. INTRODUCTION

Power assumes a critical part for being developed of the country. Today, a mostly power generated by power stations but such energy is non-renewable energy. So, today world is turning their way to renewable source of energy such as, solar energy, wind energy, etc. Piezoelectric material is also the way from where the power can be generated. It will also play important role when such power will generated by our waste energy. The formation of electrical energy from the force exerted by footstep on the floor. It will be surprising to know that the normal footstep movement on the floor can generate how much energy. As thousands of step per day is taken by each person. Electrical energy is generated by the footstep taken by the peoples as a result of walking.

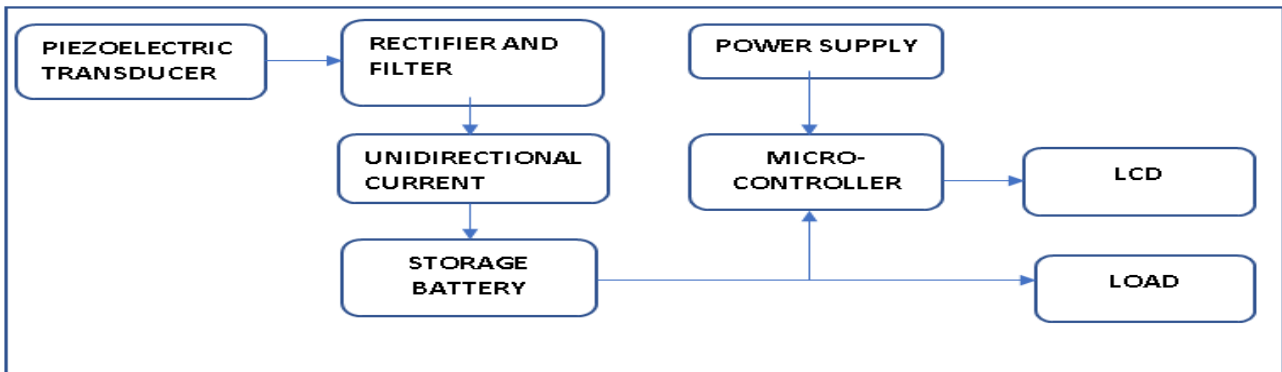
It is a fact that large amount of energy is lost by each person during routine walk which is the main source for this system. Piezoelectric is a material which converts the pressure or a force into electrical energy. The approach of this Electro-Kinetic energy floor is to convert kinetic energy into electrical energy by walking on floor. The energy that is produced from a person walking on floor is noise and pollution free. That type of energy is advantageous and even not need any type of fuel or power source to run.

Non-conventional energy source technique such a walking on the gardens, grounds, and floors etc. This system is established in heavy populated areas to apply these system wooden plates up and down will be placed and adjusted on the piezoelectric sensor and moving spring. The procedure through which the load will run. And the task is with the help of direct current to charge battery and then using inverter to convert direct current into alternating current for normal usage. At last, designing for the power generation of such types are very useful as compare to the demand of energy all over the world.

## II. THEORY

The basic working principle of our project is based on the piezoelectric sensor. To implement this we adjust the wooden plates above and below the sensors and moveable springs. Non-conventional energy using foot steps is converting mechanical energy into the electrical energy. Foot step board it consists of a 16 piezo electric which are connected in parallel. When the pressure is applied on the sensors, the sensors will convert the mechanical energy into electrical energy. This electrical energy will be stored in the 12v rechargeable battery connected to inverter. We are using conventional battery charging unit also for giving supply also for giving supply to the circuitry. This inverter is used to convert the 12 Volt D.C to 230 Volts A.C. This 230 Volt A.C voltage is used to activate the loads. By using this AC voltage we can operate AC loads.

### BLOCK DIAGRAM:



### ENERGY STORING TABLE:

The power generated by footstep is stored in an energy storing device. The output voltage from this is stored in 12V battery. The exerted force must be more than 40kg, then only the pressure applied to the material will show the output voltage. The table below show the step and voltage generated by the material.

No. of footstep	Duration of lighting of 100 watt, 230V bulb (sec)	Total energy	Voltage/step(V)
250	6-7	600	2.4
500	14-16	1200	2.4
750	18-20	1800	2.5
1000	25-28	2500	2.5

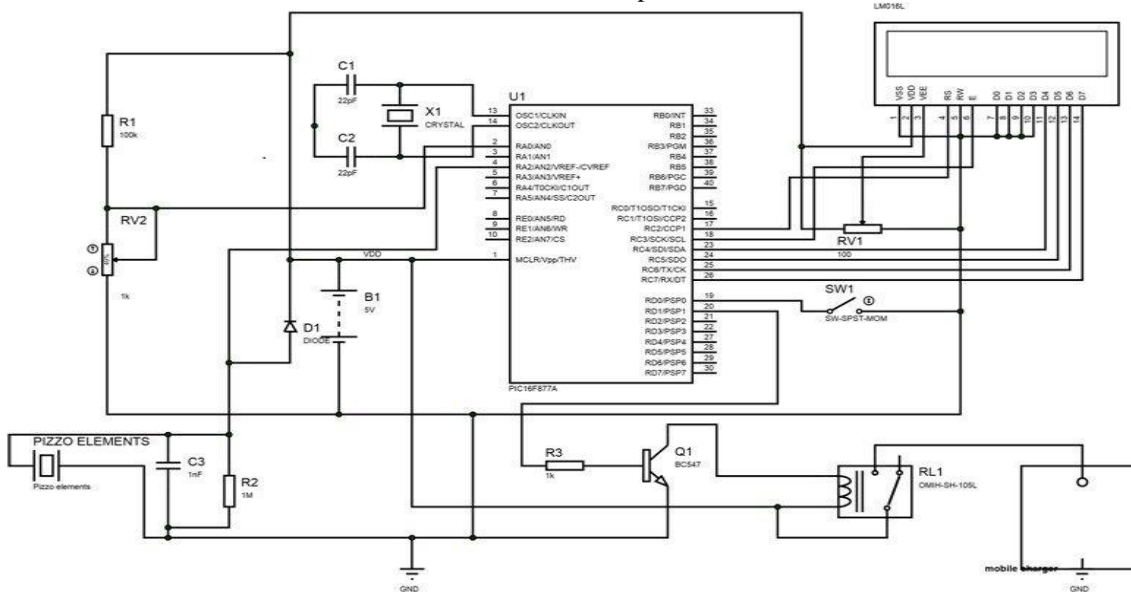
## III. DESIGN

If we talk about designing then it is a most important from hardware point of view. Because to do practical or to test our project proper circuit diagram is necessary. So, first we have used square 1x1 feet plastic-glass substance which should be unbroken if we apply pressure on it.

And placed all the piezoelectric material below it, so that indirectly the pressure is applied to it. But the drawback is that we were not getting the actual weight which is applied to the material. Then we have used a weighing machine so that we can measure how much weight should be applied to generate the energy. We got all the required components and connected them according to the block diagram. We tested the connections and made sure everything worked properly.

After making sure that connections were proper we tested the rfid card reading and the amount of time the mobile will recharge for one swipe that was selected as 5 minutes. The next stage is the parts that were used in the circuit and the

associated electronics. It is explained in the later subsections.



### III. HARDWARE

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. Piezoelectric sensors have proven to be versatile tools for the measurement of various processes. They are used for quality assurance, process control and for research and development in many different industries it was only in the 1950s that the piezoelectric effect started to be used for industrial sensing applications.

2)

2) Battery: Battery (electricity), an array of electrochemical cells for electricity storage, either individually linked or individually housed in a single unit. An electrical battery is a combination of one or more electrochemical cells, used to convert stored chemical energy into electrical energy. Lead acid batteries are the most common in PV system because their initial cost is lower and because they are readily available nearly everywhere in the world. There are many different sizes and design available, but the most important designation is that they are deep cycle batteries.

3) Rectifier: The output from the transformer is fed is fed to the rectifier. It converts A.C. into pulsating D.C. The rectifier may be half wave or full wave rectifier. In this project, a bridge rectifier is used because of its merits like good stability and full wave rectification. For the positive half cycle of the input ac voltage, diodes D1 and D3 conduct, whereas diodes D2 and D4 remain in the OFF state. The conducting diodes will be in series with the load resistance RL and hence the load current flows through RL. For the negative half cycle of the input ac voltage, diodes D2 and D4 conduct whereas, D1 and D3 remain OFF. The conducting diodes will be in series with the load resistance RL and hence the current flows through RL in the same direction as in the previous half cycle. Thus a bi-directional wave is converted into a unidirectional wave.

4) RFID: RFID card: Radio-Frequency Identification (RFID) is the use of radio waves to read and capture information stored on a tag attached to an object. A tag can be read from up to several feet away and does not need to be within direct line-of-sight of the reader to be tracked. RFID card reader: A radio frequency identification reader (RFID reader) is a device used to gather information from an RFID tag, which is used to track individual objects. Radio waves are used to transfer data from the tag to a reader.

5) Arduino: The Arduino can be a small board with a brain (called a microcontroller) that could be customized. An Arduino is an open-source microcontroller advancement board. Basically, this stage passes on an approach to manufacture and program electrical modules. The Arduino programming language is a learner's modifying language from the programming dialect C/C++, in view of which Arduino "sketches" utilizing basic programming structures, factors and capacities. At that point these are changed over in a C++ program. This enables us to download program code for this gathering, which can connect with things in this present world, you can make gadgets that react and respond to the world with this. It interfaces with LEDs, sensors, engines, LCDs, ringers, and so on for this real world. A key component of Arduino is that you can assemble controller programming on your Pc and it will definitely be downloaded to Arduino.

#### IV. RESULT AND DISCUSSIONS

The project was made in an attempt to save natural resources as well as use the simple actions such as walking on road or stairs to generate power such that it will be useful. This power then can be used in many ways one of which we have done is to charge our mobile phones. At first after a sufficient number of footsteps, the battery is stored with enough electricity to charge the phone. Using RFID the amount of time spent on charging can be regulated or controlled. Different RFID can be configured to have different effect and different charging time. This helps in saving electricity more since after that time no charging will be done until the card is swiped again.

The power generated by the footstep generator can be stored in an energy storing device. The output of the generator was fed to a 12V lead acid battery, through an ac-dc converter bridge. Initially, the battery was completely discharged. Then, the FSEC was operated by applying foot load and energy was stored in battery through an inverter.



#### V. APPLICATIONS

The aim is to make a system that can be used in many places where a lot of people gather or pass through throughout the day. These places can be railway stations, airports, temples, malls, etc. Any such place can have a section of tiles at the entrance or stairways with the system. The electricity used can be used in multiple ways according to the place viz. tube lights, fans, mobile recharge ports, or even automated doors.

Using of such abundance of population to our advantage the electricity saved can be increased. The advantages are clear: Almost no maintenance, use of renewable source of energy, no need to fuel input, almost self-generating unit no need for external power, No pollution.

#### VI. FUTURE SCOPE

Maximum crowded public can be seen in railways stations, metro station and holy places, here, such places can be used of piezoelectric crystals for generation of electricity. In holy places Gathering ranging from thousands to millions, so setting up of piezoelectric crystals at floor would generate enough power to light up lights of houses. Use of piezoelectric crystal is been started and hopeful results are attained. Better manufactured piezoelectric crystals and better selection of places of installation with further advancement in field of electronics so more electricity can be generated and it can be viewed as a next auspicious source of generating electricity. The attempts are made to develop energy from our daily life by initializing crystals in shoes, thus in each step piezoelectric crystal can be compressed which can turn enough power to charge a cell phone, mp3 player, etc. through this we can generate electrical power and use that for small electronic gadgets.

#### VII. ACKNOWLEDGEMENT

We are profoundly grateful to Prof. R.S.Deshmukh for his expert guidance and continuous encouragement throughout to see that this project rights its target. We would like to express deepest appreciation towards Dr. Varsha Shah, Principal RCOE, Mumbai and Prof. Nargis Shaikh HOD Electronics Department whose invaluable guidance supported us in this project.



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INNO  SPACE  
SJIF Scientific Journal Impact Factor

Impact Factor:  
7.488

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