



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJIRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY



INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 11, Issue 5, May 2022

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.118

Footstep Power Generation System Using Piezoelectric Crystals

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ABSTRACT: In Today's era necessity of Non- Conventional energy has increased as the requirement of power is also increasing gradually. Renewable sources such as solar, wind etc. are used to deal with this human necessity of power. However these sources are not enough and alongside the wastage of energy is increasing by several means. To overcome this problem we intent to employ the power released by human locomotion by engineering the floors with piezo electric sensors specially in more populated areas. These sensors sense the pressure of footsteps and convert the same into electrical energy. This will neither adulterate the environment, nor the change in climatic conditions can affect this. This kind of technology is an economical way of power generation and has sample of applications. Nowadays energy and power are the one of the basic needs in this modern world. Energy demand is increasing day by day. On the other hand, the many energy resources are getting exhausted and wasted. Proposal for utilization of waste energy of foot power with human locomotion is very relevant in populated countries like India where roads, railway stations, bus stands, temples, etc. are overcrowded and millions of people move around. This whole energy is wasted. If this energy made possible for utilization it will be a great invention. In this project we are converting non- conventional from just walking foot step into electrical energy. In this project we are generating electrical power as non-conventional method by simply walking or running on the footsteps. Non-conventional energy system is very essential at this time to our nation. Non-conventional energy using foot step needs no fuel input power to generate the electrical power. In this project the simple mechanism of Piezoelectric sensors is used for generating power by utilization of force which is obtained during the walking on steps is converted in to electrical energy with the help of Piezoelectric sensors. The generated power is stored by means of battery and this is used for activating the connected loads. This is one of the compact and efficient systems for generating electricity which can be easily installed in many regions.

KEYWORDS: LDR Sensor, Piezoelectric Crystals, PIC 16F Controller, Power Generation ,Automation.

I. INTRODUCTION

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 mobility of its masses will turn into boon in generating electricity from its footsteps. In India, places like roads, railway stations, bus stands, are all over crowded and millions of people move round the clock. As a result large amount of power can be obtained with the use of this promising technology. This process involves number of simple setup that are installed under the walking platform. When people walk on this platform their body weight compresses the setup which consists of multiple piezoelectric sensors and current produced is stored in dry battery. To reduce the external compression, a responsive subflooring system is installed Electricity has become such pivotal part of our modern life that one cannot think of a world without it. Almost every essential items are the product of electricity hence modern technology desires an enormous amount of electrical power for its numerous operations. Since electricity is the most valuable thing, it is important that any squandered energy must be utilized. Walking is the most common activity done by humans which releases energy in the form of vibration to the surface. This wasted energy can be metamorphosed into electrical energy using the principle called piezoelectric effect. This non-conventional technique will help to generate wattage in usable form. Piezoelectric effect is the ability of some materials to kindle an electric potential in response to applied pressure. Piezoelectric material will transmute the pressure exerted by the human locomotion into an electric current. A tile is made from piezo material for walking on it. The voltage generated across a piezo tile is furnished to a battery for it to get recharged and impart the wattage to the dc loads. The same generated voltage is given to a microprocessor as well. A LCD is interfaced to the tile employing a PIC microcontroller to display the voltage induced across the piezo tile. So this the most convenient technology for formation of Energy by means of Non-conventional Source.

II. RELATED WORK

Electricity supplies an increasing share of the world's total energy demand and is the world's fastest-growing form of delivered energy. Electricity demand will increase every year to follow population growth, prosperity improvement, and economic growth as a whole [1]. The greater demand for electricity has been putting pressure on the availability and cost of all natural resources. At this point, wind and solar power sources are intermittent and expensive. They are not viable options because of regular cloud cover and relatively weak, inconsistent wind patterns. In those areas of the country where wind is promising, it is still inherently hard to capture and is widely dispersed. Wind turbines take up a lot of space [2]. Besides the greater demand for electricity, 68% of the population in developing countries lack access to electricity. Many of the world's poor cannot afford to pay for electricity. Many countries are experiencing "a power crisis" [3]. This is the newest concept and one of the promising options for the fulfillment of electrical energy is the energy scavenging. Energy scavenging is defined as capturing minute amounts of energy from one or more of the surrounding energy sources, accumulating them and storing them for later use [4]. Energy scavenging has several advantages such as cheap, safe, maintenance free, flexible, and can be used in various occasions. One of the sources of energy in our environment that can be used and it is renewable, energy of vibration [5]. This concept can be used to produce the renewable energy in daily life and reduce the using of nonrenewable energy [6]. Piezoelectric materials have a high priority because of its stable energy density and it does not require outside powers. Piezoelectric materials can be used as a source of energy harvester, which can be applied as a supplier of power to the sensor [7]. In addition, the piezoelectric material has the ability to convert mechanical stress into electrical energy (H, A Sodano, 2004) [8]. Piezoelectric effect is a unique property that allows materials to convert mechanical energy to electrical energy and conversely, electrical energy to mechanical energy.

III. METHODOLOGY

We are using piezoelectric sensor, amplifying circuit, battery, regulator, microcontroller, ldr, lcd, buzzer, relay driver, street light. Piezoelectric sensor is used for to convert applied pressure on piezo tiles into a voltage. When the pressure is applied the voltage is generated and this output is given to the amplifying circuit. Amplifying circuit is used to control and to produce an output signal larger than that of the input signal. Here we are using 12 v Lead acid battery. Due to pressure vary the voltage spines are present in power generation. The regulator is used for to get regulated voltage from the voltage spines present in power generation. We use PIC16F690 8 bit, 7 kb flash with 256 Byte RAM and has 20MHz speed. PIC16F690 microcontroller is user friendly and cost of this is also less. Here is no sequence matter in pin configuration. The 16 * 2 LCD is used to display the voltage is generated by piezo- electric tile. The power supply unit is used to supply power to microcontroller and lcd. The IC7805 is used to convert 12v to 5v.

IV. EXPERIMENTAL RESULTS

Figures show the results of the weight to Voltage Ratio of footstep power Generator from the graph below, this graph results that as the weight increases the voltage also goes on increasing with respect to that of the weight but after some estimated weight the voltage remains constant and does not increase. Figs. (1) shows the graph of weight vs Voltage. Fig (2) Shows the piezo sensors arranged in series and parallel. Fig (b) Shows the actual hardware on which piezo Voltage and battery Voltage is Displayed.

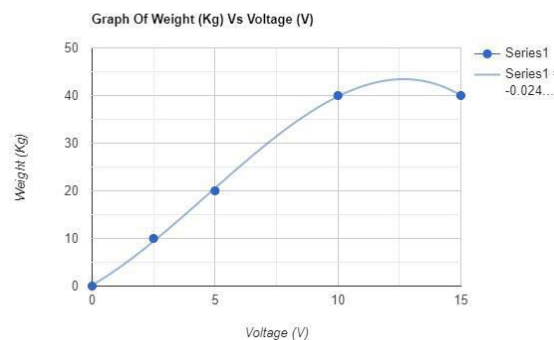


Fig 1: Weight vs Voltage

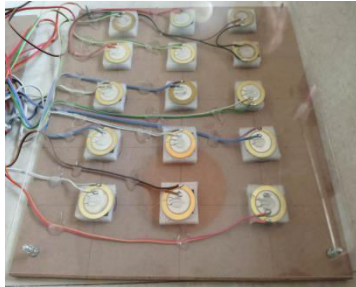


Fig 2: Piezo Crystal

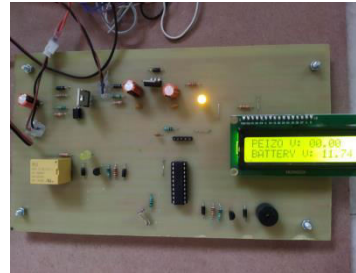


Fig 3: Controlling Circuit

V. CONCLUSION

This technique 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 well spring of energy .Thus in all we conclude that this technology can prove to be an efficacious system of generating power from human footsteps. In highly populated countries like India or China this system will prove to be a Panacea. One can also satisfy his own energy needs with this system as the energy can be altered into electrical energy by just walking or running on peizo installed tiles in a very cost effective and efficient way.

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SJIF Scientific Journal Impact Factor
Impact Factor: 8.118



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