Available online at: http://www.ijmtst.com/vol6issue05.html

International Journal for Modern Trends in Science and Technology

ISSN: 2455-3778 :: Volume: 06, Issue No: 05, May 2020

Footstep Power Generation System

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To Cite this Article

B Swetha, L Prasanna, Md. N T Anjum and Ravi Chandra, "Footstep Power Generation System", *International Journal for Modern Trends in Science and Technology*, Vol. 06, Issue 05, May 2020, pp.: 100-104; https://doi.org/10.46501/IJMTST060517

Article Info

Received on 28-March-2020, Revised on 30-April-2020, Accepted on 06-May-2020, Published on 12-May-2020.

ABSTRACT

The production of electric power from the foot step movement of the peoples and the pressure exerted during walking which is fritter away, is the main theme of this paper. The mechanical power transformation into electrical power as the pressure exerted by the footstep and by using transducers is basically called as "Foot step power generation system". Power is produced by the power generating floor and it is basically the production of electrical energy from kinetic energy. As today electricity demand is increasing and it is unable to overcome this global issue by using the traditional power generating sources. Demand and supply gap is the major issue of energy crisis. The main aim is to overcome the power crisis throughout the world although it is not enough to fulfill over excessive demand of electrical energy but it will be able to change and decrease reliance on old method of generating electricity. We can generate 1 megawatt of power if we have a 100 floor, as we are able to model a power production floor which can generate up to 1000 watt on just twelve footsteps means one unit and it is capable to generate 10000w power for just 120 footsteps. It can be installed on road side footpath, parks and jogging tracks and many other public place, airport etc. and have great impact of this and will create great difference in the electrical power generation system

KEYWORDS: *Renewable Energy, Piezoelectric, Electrical Energy, Footstep power generation system.*

DOI: https://doi.org/10.46501/IJMTST060517

I. INTRODUCTION

The conversion of energy that exhausted and wasted while walking or running. This energy is converted in to electrical energy. This is the latest trend in electrical power generation and it is achieved by converting human's kinetic energy. However there are a unit different physical Phenomena as well as piezo effect which will conjointly convert mechanical movements into electricity.The piezoelectricity exists in 2 domains, the primary is that the direct piezo electricity that describes the material's ability to remodel mechanical strain into electrical charge, the second kind is that the converse impact, that is that the ability toconvert associate applied electrical potential into mechanical strain electricity ceramics belong to the cluster of ferroelectric materials. Ferroelectric materials area unit crystals that area unit polar while not an electrical field being applied. At this point of time, power has turned into a life saver for human populace. Vitality is only the capacity to take every

necessary step. In our life, Electricity is most generated voltage in usually utilized resource. Piezoelectricity impact alludes to the capacity of a few materials to create an electric potential. A treadmill is a device basically used for running and to loss calories.in our project we are converting that energy into electrical energy. Voltage generation can furnish a handy substitute to natural vigour sources used to function certain Types of sensors/actuators, telemetry, and MEMS contraptionsthe advances have allowed infinite doorways to open for energy harvesting strategies in realistic actual-world applications. Plenty of the look at into energy harvesting has all in favour of techniques of amassing the power except an enough quantity is praise, permitting the intended electronics to be powered. With the introduction of the countless handheld movable digital items, energy gather has grown to be one in every of the exciting topics of curiosity to furnish movable electrical power. The most often used sources are: solar voltage, wind power and electrical energy. This achieve skills of is curious about electrical energy considering that the truth that it depends on the mechanical stress or traces to get vigor, whereas the reverse sources don't appear to be reliable in the least instances.

II. PIEZO ELECTRIC SENSOR

The most of the analysis at intervals the energy field is to develop sources of energy for future. It is time to hunt out renewable surceases of energy for the long term. Electricity materials area unit being loads of and loads of studied as they find yourself to be very uncommon materials with very specific and interesting properties. In fact, there materials have the flexibleness to supply electricity from energy as associate degree example they'll convert mechanical behaviour like vibrations in to electricity. Such devices area unit usually named as energy harvesters and can be utilized in applications where outside power is untouchable and batteries aren't a doable alternative. Whereas recent experiments have shown that these materials is also used as power generators, the amount of energy created continues to be very low, so the need to optimize them. Electricity materials have a pair of properties that area unit define as direct and converse result. Direct result's that the property of some materials to develop electrical change on their surface once mechanical stress is In previous number of years low power electronic devices. Unit increased quickly. The devices area unit utilised in associate degree outsized range to comfort our daily lives. With the increase in energy consumption of these transferable electronic device. Completely different renewable energy in human surroundings arise a replacement interest among during this project I plan to develop an electricity generator. Which will end up energy from vibration and pressure on the market on another term (like people walking). This project describes the use of electricity materialstherefore on reap energy from people walking vibration for generating and accumulating the energy. This concept is in addition applicable to some large vibration sourceswhich could notice from nature. This project in addition represents a footstep Electricityenergy gathering model that's worth effective and easy to implement. Exerted on them, whereas converse result's that the property of some materials to enhance and develop mechanical stress once associate degree electrical charge is induced.

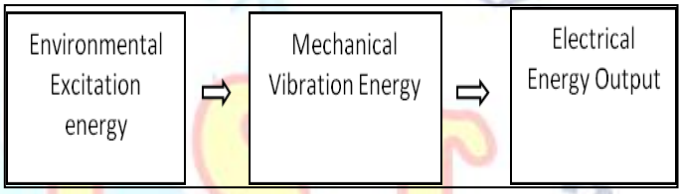

Figure 1 Piezoelectric energy conversion

A. Study of Piezo Materials:

Piezoelectric ceramics belong to the group of ferroelectric materials. Ferroelectric materials are crystals which are polar without an electric field being applied. The piezoelectric effect is common in piezo ceramics like PbTiO3, PbZrO3, PVDF and PZT. The main component of the project is the piezoelectric material. The proper choice of the piezo material is of prime importance. For this, an analysis on the 2 most commonly available piezoelectric material - PZT and PVDF, to determine the most suitable material was done. The criterion for selection was better output voltage for various pressures applied. In order to understand the output corresponding to the various forces applied, the V-I characteristics of each material namely, PZT and PVDF were plotted. For this the Piezo transducer material under test is placed on a Piezo force sensor. Voltmeters are connected across both of them for measuring voltages and an ammeter is connected to measure the current. As varying forces are applied on the Piezo material, different voltage readings corresponding to the force is displayed. For each such voltage reading across the force sensor,

various voltage and current readings of the Piezo test material are noted.

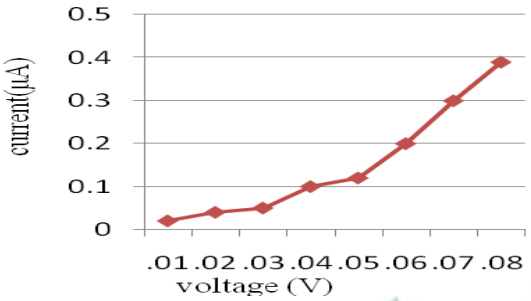

Fig 2: V-I graph of PVDF material

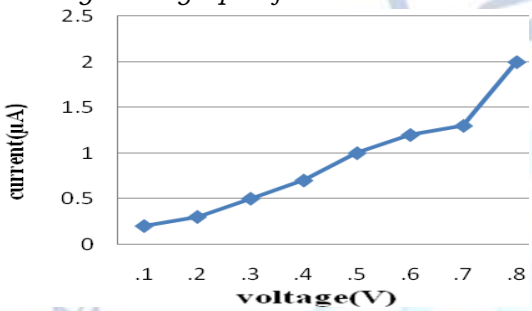

Fig 3: V-I graph of PZT

The voltage from PZT is around 2 V where as that of PVDF is around 0.4V.We can thus conclude that better output is obtained from the PZT than the PVDF.

B. Study of Connections

Next to determine the kind of connection that gives appreciable voltage and current necessary, three PZT are connected in series. A force sensor and voltmeter is connected to this series combination. As varying forces are applied on this connection, corresponding voltages are noted. Also the voltage generated across the series connection and the current is measured. Similarly the connections are done for parallel and seriesparallel connections are done and the graphs are as in figures 4 & 5. It can be seen from the graph that the voltage from a series connection is good but the current obtained is poor, whereas the current from a parallel connection is good but the voltage is poor. But this problem is rectified in a series - parallel connection where a good voltage as well as current can be obtained [4].

Fig .4: PZT in series connection

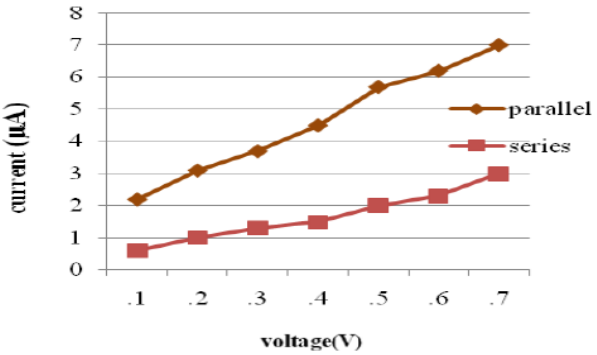

Fig 5: V-I graph of parallel and series connection

III. HARDWARE IMPLEMENTATION

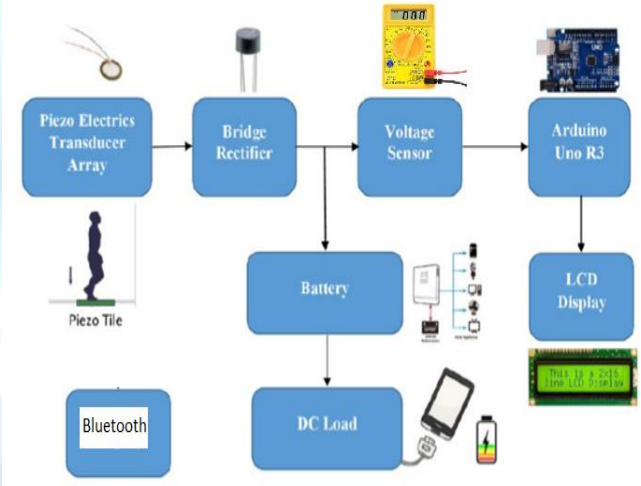

Fig 6: Block Diagram

The piezoelectric material converts the pressure applied to it into electrical energy. The source of pressure can be either from the weight of the moving vehicles or from the weight of the people walking over it. The output of the piezoelectric material is not a steady one. So a bridge circuit is used to convert this variable voltage into a linear one. Again an AC ripple filter is used to filter out any further fluctuations in the output. The output dc voltage is then stored in a rechargeable battery. As the power output from a single piezo-film was extremely low, combination of few Piezo films was investigated. Two possible connections were tested

- parallel and series connections. The parallel connection did not show significant increase in the voltage output. With series connection, additional piezo-film results in increased of voltage output but not in linear proportion. So here a combination of both parallel and series connection is employed for producing 40V voltage output with high current density. From battery provisions are provided to connect dc load. An inverter is connected to battery to provide provision to connect AC load. The voltage produced across the tile can be seen in a LCD. For this purpose microcontroller PIC16F873A is used. The microcontroller uses a crystal oscillator for its operation. The output of the microcontroller is then given to the LCD which then displays the voltage levels.

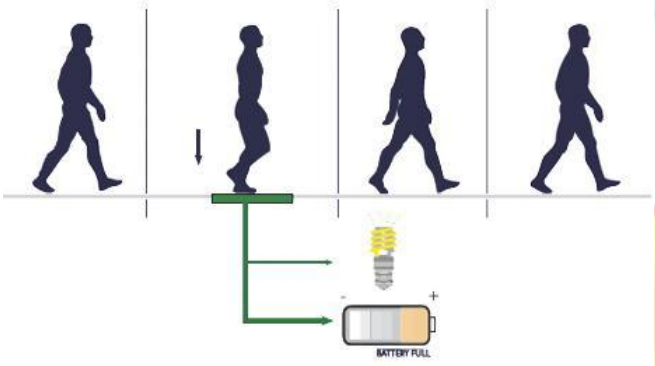

Fig 7: Schematic representation of the working model

The inverter used in this circuit uses the IC CD4047. It is used to convert the DC voltage stored in the battery to AC voltage. IC CD4047 produces two pulse trains phase shifted by 180°. These pulse trains are used to switch transistors configured in common emitter mode producing pulse trains of 12V, which is capable of switching a MOSFET. The sources of the two MOSFETs used in the inverter circuit are supplied with a 12V supply. When the MOSFETs are switched on by the outputs of the transistors, two output pulses of 12V are obtained. These pulses are connected to a step up transformer from whose high voltage side; we obtain the 220V AC supply.

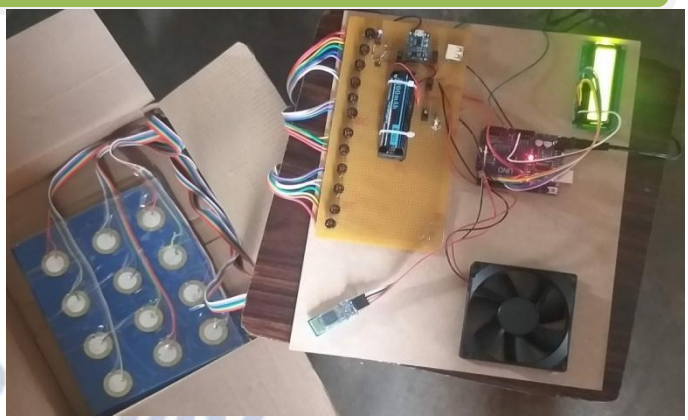

Fig 8: Hard Ware Implementation

IV. CONCLUSION

From the research work , authors can conclude that (i) this is a new way for humans to get electrical energy without having to pay such a large cost yet environmentally friendly. ii. More force or pressure exerted by the steps; more voltage generated. iii. Unlimited source of energy because the power generation can be simply generated by walking, running or exercising on the steps. Large scale power generation is possible when a big number of devices are placed in a crowded area. Piezocomposite materials have shown potential as sources of alternative electrical power capable of generating enough energy to power ultra low power microelectronic. Although our initial endeavor into the fabrication of flexible piezo composites did not yield significant results, we intend to further refine the fabrication procedure of flexible piezo harvesters to get better outputs as we believe the problem is in the fabrication process. Also, the focus in the succeeding chapters will be on energy harvesting using piezo-composite diaphragms.

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