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A Survey on Footstep Power Generation by Piezzo-Electric Material

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ABSTRACT: Energy is required for continuous growth and sustenance. It is required to find the solution for alternate resources, as lot of energy resources would be exhausted in near future. Hence, proposal for the utilization of waste energy through human efforts and here we have considered foot power of human locomotion. When the flooring is engineered with piezo electric technology, the electrical energy produced by the pressure is captured by floor sensors and converted to an electrical charge by piezo transducers, then stored and used as a power source. And this power source has many applications as in agriculture, home application and street lighting and as energy source for sensors in remote locations.

This project is about generating electricity when people walk on the floor and making use of the forces exerted when a person walks. The idea is to convert the weight energy to electrical energy. The Power generating floor intends to translate the kinetic energy to the electrical power. The objective of this project is to make a working model of Piezo Electric based energy generation. It won't meet the requirement of electricity but roughly if we are able to design a power generating floor that can produce 100W on just 12 steps, then for 120 steps we can produce 1000 Watt and if we install such type of 100 floors with this system then it can produce 1MW. Which itself is an achievement to make it significant.

I. INTRODUCTION

For an alternate method to generate electricity there are number of methods by which electricity can be produced, out if such methods footstep energy generation can be an effective method to generate electricity.

Walking is the most common activity in human life. When a person walks, he loses energy to the road surface in the form of impact, vibration, sound etc. due to the transfer of his weight on to the road surface, through foot falls on the ground during every step. This energy can be tapped and converted in the usable form such as in electrical form. This device, if embedded in the footpath, can convert foot impact energy into electrical form.

Human-powered transport has been in existence since time immemorial in the form of walking, running and swimming. However modern technology has led to machines to enhance the use of human-power in more efficient manner. In this context, pedal power is an excellent source of energy and has been in use since the nineteenth century making use of the most powerful muscles in the body. Ninety-five percent of the exertion put into pedal power is converted into energy. Pedal power can be applied to a wide range of jobs and is a simple, cheap, and convenient source of energy. However, human kinetic energy can be useful in a number of ways but it can also be used to generate electricity based on different approaches and many organizations are already implementing human powered technologies to generate electricity to power small electronic appliances.

The working of the Foot Stop Electric Converter (FSEC) is demonstrated in photographs in The right side photograph shows the foot touching the top plate without applying weight. The left side Photograph shows the foot when full weight of the body is transferred to the top plate. A 6 W, 12V bulb connected to the output of the alternator

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glows, to indicate the electric output when foot load is applied. The unit is designed to generate full power pulse when actuated by a person weighing nearly 60 kg. An experimental plot of voltage vs. time was generated, by using an oscilloscope. Using voltage data and the load (a resistor), a typical plot of power vs. time was generated.

The power generated by the foot step generator can be stored in an energy storing device. The output of the generator was fed to a 12 V 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 the battery.

II.AIM AND OBJECTIVES

Prepare a requirement document to reach expectations of project and to come up with functionalities which are needed to be implemented. Documentation of expected output for various aspects with accepted margin error was also documented. To design overall system based on workflow requirements. Discussion with the project guide and Head of Department on ways to improve the design and to optimize performance. Choosing suitable components and methods based on the configurations availability and requirements.

Recommendations:

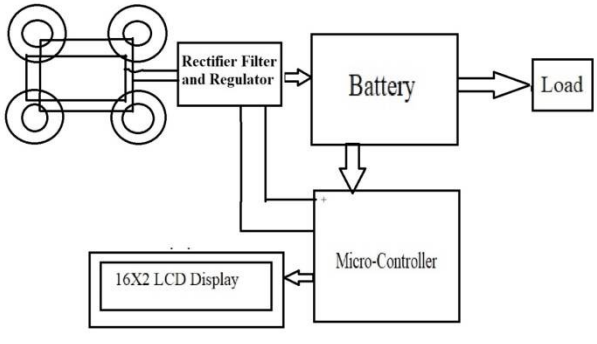
As a trainee mechanical engineer, I wanted to work on a project work that would showcase my engineering knowledge. I got the opportunity to work on FOOT STEP POWER GENERATION. This project was very important as it evaluated my skills and talents in my company.

III. BLOCK DIAGRAM AND WORKING

Power Generation Using Foot Step the conversion of the force energy into electrical energy. The control mechanism carries the rack & pinion, D.C generator, battery and inverter control. We have discussed the various applications and further extension also.

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.

- Whenever force is applied on piezoelectric sensor, then the force is converted into electrical energy.
- In that movement, the output voltage is stored in the battery
- The output voltage which is generated from the sensor is used to drive DC loads
- Here we are using AT89S52 to display the amount of battery get charged.



Block Diagram : Power Generation using footstep

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IV. CIRCUIT DIAGRAM AND CALCULATION

- **BASIC CALCULATION**

For **3Watt 15Volt** generation by piezo-electric element.

One piezo-electric material generate,
P=0.2Watt V=15Volt

- For the generation of 15Volt,

$$=\frac{15\text{Volt}}{1.5\text{Volt}} = 10$$

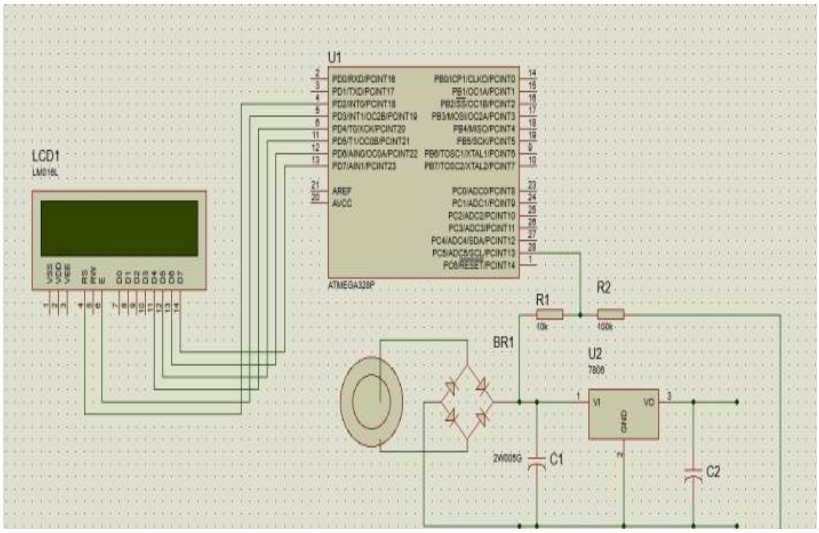
Means, 10 number of piezo-electric element are connected in parallel.

- For the generation of 3Watt,

$$=\frac{3\text{Watt}}{0.3\text{Watt}} = 15$$

Means, 15 number of piezo-electric element are connected in series.

Total number of piezo plate required is =15*10=150
So,near about 150 piezo plate are required for generation of 3Watt 15Volt.



V. APPLICATION

- Foot step generated power can be used for agricultural, home applications, street-lighting.
- Foot step power generation can be used in emergency power failure situations.
- Metros, Rural Applications etc.
- It can be used as a source for both A.C and D.C applications.
- It is also used in universities .
- It can use in emergency power failure situations like hospitals.

VI. CONCLUSION

The project “POWER GENERATION USING FOOT STEP” is successfully tested and implemented which is the best economical, affordable energy solution to common people. 2. 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

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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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