

# Energy Generation and Implementation of Power Floor (Pavegen)

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**Abstract** - India is the developing country and now a days the demand for energy has been increasing at an alarming rate and there has been a decrease in the availability of energy resources. For sustainable development, the need of the hour is to develop more efficient, pollution free and renewable energy resources to meet the unending demands. It is clear that many different sources will be required to meet the nation’s energy demands, with much research being carried out into a broad range of technologies in an attempt to meet this demand. Our paper is one such attempt to generate electrical energy from footsteps. The method being employed by us is using piezoelectric crystals.

The idea is to develop a “Power Floor” which is actually a floor that can produce electricity when stepped upon. In this paper we have reviewed various concepts and methods of energy harvesting from a piezoelectric crystal. The generation of electrical energy is inextricably linked to the presence of human activity it follows that areas with high human activity will offer the greatest potential for electrical energy generation.

**Key Words:** Piezoelectric material, rectifier, power generating floor, weight energy.

## 1. Introduction

Road-based create a unique opportunity to make use of existing real estate (roads) and a significant, free, and currently untapped energy through techniques developed by men. Their relative low impact on the environment makes them energies of the future that help humanity to face the problem of the management of the waste of the nuclear energy and the emissions of greenhouse gases. Renewable energies also represent an opportunity for more than two billions isolated people to finally reach electricity. It is clear that many different sources will be required to meet the nation’s energy demands, with much research being carried out into a broad range of technologies in an attempt to meet this demand.

One alternative source of energy generation could be human energy harvesting, where the source of energy generation is energy expended by the human body such as work in everyday activities such as walking, opening doors or even typing etc. Much research has been carried out in the field of personal energy generators, where a device is attached to an individual and the generated energy used for portable loads. Recently however, there appears to be a

trend towards developing devices embedded in the urban environment, and provides the focus of this thesis.

The generation of electrical energy is inextricably linked to the presence of human activity it follows that areas with high human activity will offer the greatest potential for electrical energy generation. As such it is expected that such devices will only be installed where large numbers of people transit, thus having a negligible effect on an individual whilst still providing considerable potential. Since human activity is spread throughout the urban environment it can be considered as a diffuse source of energy.

Their relative low impact on the environment makes them energies of the future that help humanity to face the problem of the management of the waste of the nuclear energy and the emissions of greenhouse gases. Renewable energies also represent an opportunity for more than two billions isolated people to finally reach electricity. These assets, together with increasingly efficient technologies, favor the development of renewable energies, but still very unevenly depending on the type of resources considered. With energy consumption increasing, it seems unlikely that renewable energy will replace other energy resources in the near future. It is therefore important that each one of us closely monitors his/her own energy consumption.

## 1.2 Objectives of Pavegen

- To generate green Energy with help of “Pavegen.”
- To use the Electricity in Emergency.
- For use of Smart Data Sensing.
- Clean, renewable and environmentally friendly energy generation

## 2. METHODOLOGY

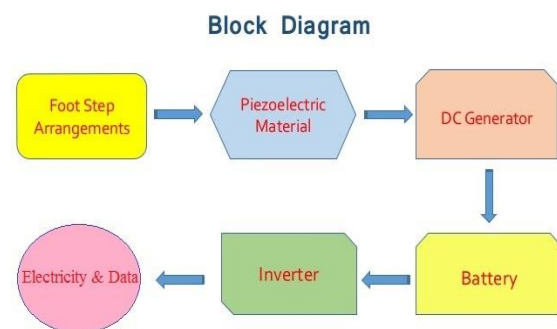


Fig. (2.0) Block Diagram of Pavegen Process

## 2.1 Foot Step Arrangements

When people step on the surface of Pavegen tile, it deflects by 5mm as shown in figure to generate electricity. Since UBC is planning to install Pavegen tiles on the stairs in new SUB, our team did some research to see if this will be a tripping hazard. Inspectapedia.com states that “[a variation] more than 3/8 of an inch (9.525mm) in variation of the height of steps from one step to another is a tripping hazard”. Since Pavegen only deflects by 5mm, it is safe to be installed on the stairs.



Fig.2.1.: Foot Step Arrangement

It's creating the electrical energy by utilizing the weight energy or the human body mass, one can just stuns by knowing how much energy a man can have by essentially strolling on the ground with an ordinary speed. As individuals' means (thousands upon thousands a day) use and channel active energy excessively. At whatever point a man strolls, figures out how to lose energy towards the ground by method for impact, vibration, and sound and soon, an aftereffect of the move of overabundance weight to the floor. That energy might be utilized and changed over into electrical energy. The genuine electro-motor ground is truly a way to deal with making electrical energy by utilizing the active energy of the individual who strolls on the floor. The power ground dislike conventional floor. The energy delivered by this ground will be condition agreeable without having exhaust cloud. Delivering this kind of energy will be financially savvy moreover. The power ground does not require any fuel or maybe any kind of energy asset, just making utilization of motor energy. Based upon your abundance weight from a man proceeding onward the ground.

## 2.2 Piezoelectric Materials

Piezoelectric materials can be natural or man-made. The natural PEM are crystal materials like quartz ( $SiO_2$ ), Rochelle salt, Topaz, Tourmaline-group minerals and some organic substances as silk, wood, enamel, dentin, bone, hair, rubber. The unit cell of quartz which has specific atomic structure of the lattice which is a tetrahedron built of oxygen

atoms around a silicon atom. Each oxygen atom has the same distance to the silicon atom, and the distances between the oxygen atoms are all the same. The change in the position of the atoms due to applied stress leads to the formation of net dipole moments that causes polarization and an electric field, respectively. Man-made piezoelectric materials are crystals that are quartz analogs, ceramics, polymers and composites. There are 32 crystal classes which are divided into the following seven groups: triclinic, monoclinic, orthorhombic, tetragonal, trigonal, hexagonal and cubic. These groups are also associated with the elastic nature of the material where triclinic represents an anisotropic material, orthorhombic represents an orthotropic material and cubic are in most cases isotropic materials. Only 20 of the 32 classes' allow piezoelectric properties.

Mechanical energy is a standout amongst the most pervasive energies that can be reused in our environment. The wellsprings of mechanical energy can be a vibrating structure, a moving article, and vibration instigated by streaming air or water. The energies related to incite vibrations or development by stream of air and water everywhere scale are wind energy and hydroelectric energy, separately, which are not inside the extent of this section of the project. Rather, the mechanical energies here can be delegated purported "low-level" vibrations and developments.

Mechanical waste energies for the most part can be collected by utilizing vibration-to power transformation. The most recognized normal for this sort of waste energy harvesting is at first distinguished for low power eras. In this way, one of the focused on applications is to power little electronic gadgets. In any case, late advancement demonstrates that it can likewise be utilized for substantial scale applications. Vibration-to-power transformation can be acknowledged through three essential components, including electromagnetic, electrostatic, and piezoelectric transductions.

Among the three systems, piezoelectric transduction has gotten the best consideration. This is on account of piezoelectric materials have bigger power densities and higher attainability for viable applications than the materials utilized as a part of the other two systems. For instance, voltage yields in electromagnetic energy harvesting are normally low and accordingly should be intensified to a level adequately high to charge stockpiling gadgets. Conversely, nonetheless, piezoelectric energy harvesters yield voltages that can be utilized specifically. In electrostatic energy harvesting, the materials ought to be liable to an outer connected voltage to trigger the relative vibratory movement of the capacitor components, which yields elective electrical streams. Such outer connected voltages are required in piezoelectric energy harvesting. Another favorable position over electromagnetic gadgets is that piezoelectric harvesting gadgets can be manufactured at both full scale and smaller scale, because of the entrenched

testimony systems for thick-movies and thin-movies piezoelectric

Quartz Power Devices are prescribed for dynamic power functions. They are not utilized as 'load cells' for motionless (static) functions. Quick reaction, roughness, solidness equivalent to strong steel, stretched out extents and the capacity to likewise gauge semi-static powers are standard elements related with PCB quartz power devices.

The accompanying data introduces a portion of the plan and working attributes of PCB power devices to help you better see how they work, which thusly, will "help you improve dynamic estimations".

### 2.3 DC Generator

ICP power devices join an inherent microelectronic enhancer to change over the high impedance charge yield into a low impedance voltage motion for recording. ICP devices, powered from a different steady current source, work over long customary coaxial or strip link without flag corruption. The low impedance voltage flag is not influenced by triboelectric link clamor or contaminants.

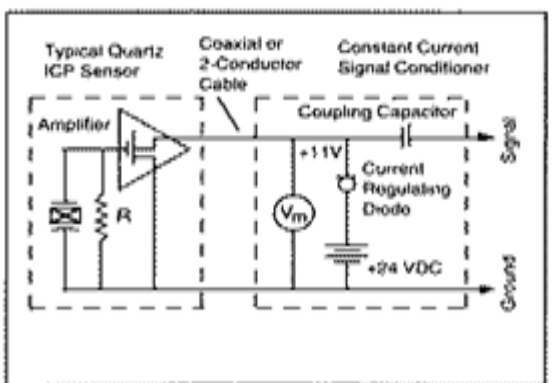


Fig 3.3 DC Generator

Power to work ICP devices is by and large as a minimal effort, 24-27 VDC, 2-20 mA steady current supply. Figure 5 schematically represents an ordinary ICP device framework. PCB offers various AC or battery-powered, single or multi-channel power/flag conditioners, with or without pick up abilities for use with power devices. (See Related Products Section of this inventory for accessible models.) Moreover, numerous information procurement frameworks now fuse steady current power for specifically powering ICP devices. Since static adjustment or semi static here and now reaction enduring up to few moments is frequently required, PCB makes flag conditioners that gives DC coupling.

### 2.4 Battery

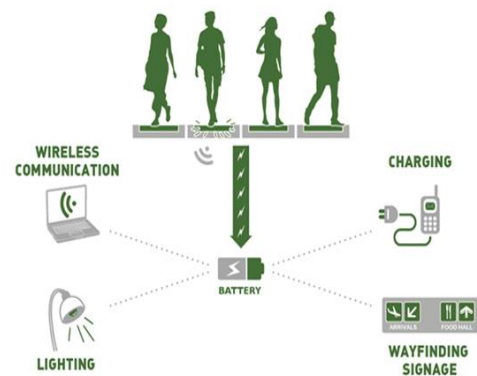


Fig. 3.4 Use of Battery

Power is generated when a footfall compresses the slab by about 5 mm (0.2 in). The exact technology is a secret, but Pavegen officials have said it involves electromagnetic induction by copper coils and magnets. Pavegen says each pedestrian generates an average of 5 watts per footstep at 12-48 volts DC, enough to run an LED street lamp for 30 seconds.

### 3. CONCLUSION

Electricity is produced due to pressing the piezo material enough to make the L.E.D. glow. Based on the results gathered in this investigation, the final prototype design do fulfil the engineering goal of generating electricity sufficient to power common electrical devices.

### ACKNOWLEDGEMENT

I have a great pleasure to express my deep sense of gratitude and sincere regards to my Guide Prof. Shreedhar Patil. for his guidance and friendly discussion which helped me immensely in selecting this topic. His generous encouragement throughout my dissertation work helped me in completing this project work. I would like to thank our Head of Civil Engineering Department Dr. Nagesh Shelke for allowing me to do this project. He has immensely helped in providing all opportunities and facilities for the project work. I would also like to thank Dr. Ashok Kasnale, Principal, Dr. D Y Patil School of Engineering and Technology, for providing all facilities at the right period of time. I am thankful to all the faculty members of Civil Engineering and library staff for helping me in this work. Finally, I would like to thank all those who directly or indirectly helped me during my work.

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