

Case Study on Power Generating Pavements

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Abstract: This review is all about generating electricity when people walk on the Floor. Think about the forces you exert which is wasted when a person walks on the floor. The idea is to convert this force to electrical energy. The Power Generating floor intends to translate the kinetic energy to the electrical power. Energy Crisis is the main issue of world these days. The motto of this research work is to face this crisis somehow. Though it won't meet the requirement of electricity but as a matter of fact 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 1MegaWatt. Which itself is an achievement to make it significant.

KEYWORDS: Piezoelectric Materials, rectifier, power generating floor, weight energy.



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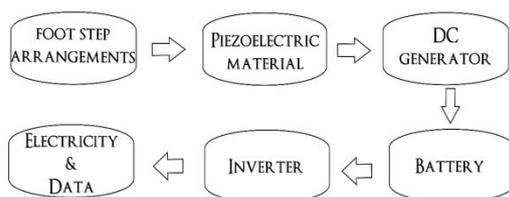
I. INTRODUCTION

Laurence Kembell-Cook, the director of Pavegen Systems imagined a new idea to generate electricity from pavement slabs. This idea later named as Pavegen technology. It is also known as kinetic footfall. Most of the countries try to innovate alternative electricity power for their usage. In civil construction field, they introduce an energy conserving technology as a replacement for tiles. The first-generation tile was made from recycled, with the top surface made from recycled truck tires. 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 enough to run an LED street lamp for 30 seconds. Most of countries try to innovate alternative electricity power for their affects. Lot of countries has found lot of methods to generate electricity power. Are you thinking that the solar energy and the wind energy are the only renewable sources we have in our world. No that's a wrong concept we are having in our mind. Today it easy to produce electricity using our foot-steps. 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.

OBJECTIVES OF PEVEGEN:

- To use the Electricity in Emergency conditions or situations.
- For use of Smart Data Sensing.
- To generate green Energy by the help of "Pavegen."
- Eco friendly, renewable and clean energy generation.

METHODOLOGY:



Block Diagram of Pavegen Process

II. FOOT STEPS ARRANGEMENT

In short, it creates energy from footsteps using a unique tile-based system. 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.



Foot Step Arrangement

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. Pevegen has developed an energy recovery system powered through footsteps. The concept harnesses the kinetic energy from footsteps and converts it into renewable electricity. By stepping, jumping, or hopping on a 'pevegen floor tile', users create clean, off-grid electricity used to power multiple applications – from lighting, to interactive learning displays and charging points. Data can be collected on the harvested input, displaying in real-time on any web address from each unit. 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. This way it can make cities work by itself to produce both data and energy.

III. PIEZO ELECTRIC MATERIALS

Piezoelectric materials can be natural or man-made. The natural PEM are crystal materials like quartz (SiO₂), Rochelle salt, Topaz etc., piezoelectric materials are materials that have the ability to generate internal electrical charge from applied mechanical stress. The term piezo is Greek for "push". Several naturally

occurring substances in nature demonstrate the piezoelectric effect. These include:

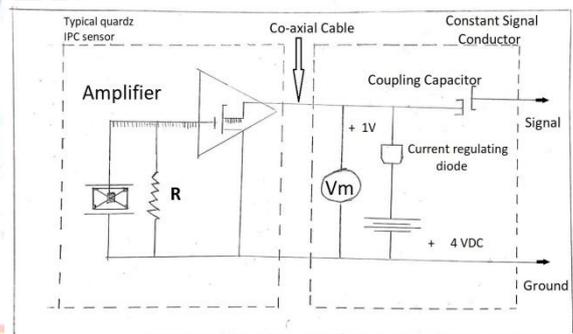
- Bone
- Crystals
- Certain ceramics
- DNA
- Enamel
- Silk
- Dentin, and many more.

The piezoelectric effect – the ability of certain materials to generate an electrical current when compressed – as well as induction, through numerous tiny copper coils and magnets, to create a charge. Materials that exhibit the piezoelectric effect also demonstrate the inverse piezoelectric effect (also called the reverse or converse piezoelectric effect). The inverse piezoelectric effect is the internal generation of mechanical strain in response to an applied electrical field. In particular, advancements in the understanding of the relationship between crystal structure and electromechanical activity along with other developments in research shifted the approach toward piezoelectric technology entirely. For the first time, engineers were able to manipulate piezoelectric materials for a specific device application, rather than observing properties of the materials and then searching for suitable applications of the observed properties.

This development created many war-related applications of piezoelectric materials such as super-sensitive microphones, powerful sonar devices, son buoys (small buoys with hydrophone listening and radio-transmitting capabilities for monitoring movement of ocean vessels) and piezo ignition systems for single cylinder ignitions. 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".

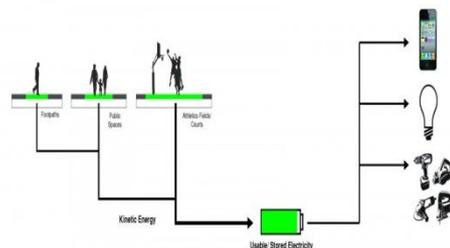
IV. DC GENERATORS

A direct-current (DC) generator is a rotating machine that supplies an electrical output with unidirectional voltage and current. The basic principles of operation are the same as those for synchronous generators. The Power to work ICP devices is by and large as a minimal effort, 24-27 VDC, 2-20 mA steady current supply. PCB offers various AC or battery-powered, single or multichannel power/flag conditioners, with or without pick up abilities for use with power devices. The fuse steady current power for specifically powering ICP devices.



DC GENERATOR BATTERY

The Pavegen once claimed that the 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 streetlamp for 30 seconds. Pavegen's patented systems produce around 3 joules of energy per footstep or up to 5 watts of power while someone is walking, enough to power applications such as environmental sensors, LED lighting and screens and for storage in batteries.



USAGE OF BATTERY IN PAVEGEN ADVANTAGES

- These tiles can be used indoors or outdoors in high traffic areas, and generates electricity from pedestrian footfall.
- If we implement this technology, we can supply the power to grids such as pedestrian lighting.

- We can reduce approximately 6.817 tons of excessive CO₂ every day emissions by tiles into atmosphere, by using Pavegen technology.
- To reduce the global warming caused while using traditional carbon fuels.
- Harvesting human power to produce energy is best practice in order to fulfill the energy demand.
- Less maintenance cost. • It is waterproof and damp proof.
- Tiles are completely Renewable & Eco-friendly technology.
- The top surface is built entirely of recycled material.

APPLICATIONS

- This idea can be implemented in the floors of crowded places as footpaths, railway platforms etc.
- Stairs can be also used for production of energy by walking
- Used for security purposes and in various alarm systems.
- For street lights.
- In bus station.
- In airports.
- In play grounds.

CONCLUSION

Promoting energy awareness is an integral part of this proposal. Piezo tiles have been capable for generating 40V. They are particularly suitable for implementation in crowded areas. Based on the results gathered in this investigation, the final prototype design fulfils the engineering goal of generating electricity sufficient to power common electrical devices. Energy generation source must be something easily implemented. It is a future energy renewable resource using kinetic energy.

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