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GENERATION OF ELECTRICITY BY USING FOOTSTEPS

***SANGRAM.K.L[1],SHEKHAR.R.S[2]. ABHIJIT.U.S[3]*, SHAILESH.P.B[4], KAMAL.K.S[5]**

[1, 2 ,3,4,5]Department of Civil Engineering,
SVPM'S College of Engineering, Pune University,
Malegaon(bk),Baramti,Pune.
sangram.langore0202@gmail.com

ABSTRACT :
In this project we are generating electrical power as non-conventional method bysimply running on the train in the foot step. Non-conventional energy system is veryessential at this time to our nation. Non-conventional energy using foot stepneeds nofuel input power to generate the output of the electrical power. This project usingsimple drive mechanism such as rock and pinion assemble and chain drive mechanism.For this project the conversion of the force energy in to electrical energy. Thecontrol mechanism carries the rack & pinion, D.C generator, battery and invertercontrol. We have discussed the various applications and further extension also. So thisproject is implemented to all foot step, the power generation is very high. The initial costof this arrangement is highThis device if embedded in the footpath, can convert foot impact energy into electrical form. The working principle is, when pedestrian steps on the top plate of the device, the plate will dip down slightly due to the weight of the pedestrian. The downward movement of the plate results in the compression of the piezoelectric material fitted in the device, to produce electrical energy.

***KEYWORDS** :EXACAVATION, SAND BEDDING, PIEZOELECTRIC ARRAYS, ELECTRICITY GENERATION ETC.*

1. Introduction

Energy harvesting also known as power harvesting or energy scavenging is the process by which energy is derived from external sources e.g. solar power, thermal energy, wind energy, salinity gradients, and kinetic energy, captured, and stored for small, wireless autonomous devices, like those used in wearable electronics and wireless sensor networks.

While the input fuel to some large scale generation costs money (oil, coal, etc.), the energy source for energy harvesters is present as ambient background and is free. For example, temperature gradients exist from the operation of a combustion engine and in urban areas; there is a large amount of electromagnetic energy in the environment because of radio and television broadcasting.

Over the past two decades, there has been significant interest in converting mechanical energy from human motion into electrical energy. This electrical energy can then be used to Recharge batteries in electronic devices or directly power small scale, Low-power circuits. It is desirable to scavenge or harvest Energy from human movement, while the user is performing His/her everyday activities. Some of the earliest work to harvest energy from human gait Dates back almost 250 years and include the self-winding Watch and closely related modern electromechanical (or so called Electrical) self-winding watches, and various shoe mounted Foot cranks Driven by the potential to power small, portable electronic devices, the first work in self-powered electrical Energy harvesting included

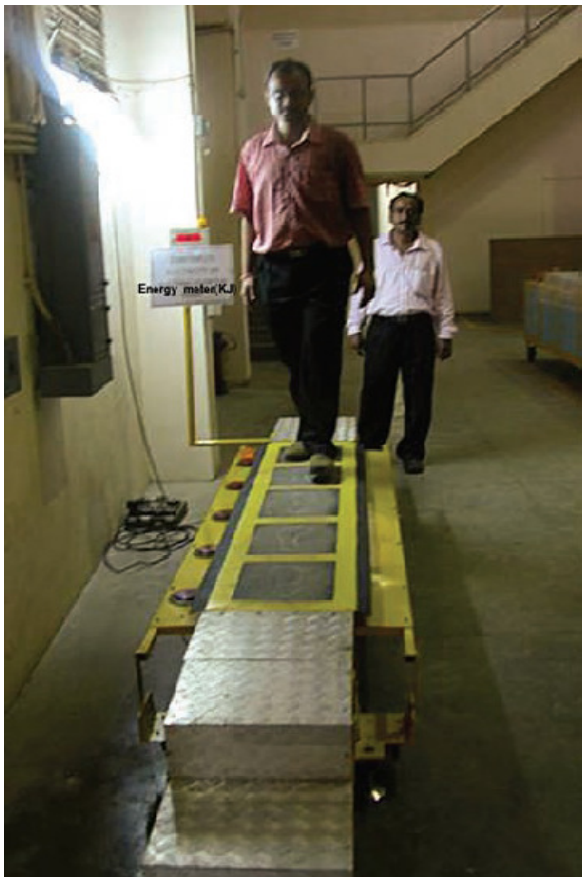

Fig. 1.: Multi Unit FSEC Platform

electromagnetic vibration in A device carried on the hip, and piezoelectric strain energy Harvesting by a device mounted in the heel of a shoe. This Initial work has led to substantial interest in gait powered energy Harvesting.

Piezoelectric floor generates electricity through the deformation of the material under a load. Due to the high foot traffic of the campus center throughout the weekday, the energy harvested potential and energy awareness can be recognized.

This opportunity constitutes a pilot program that upon its successful completion will provide a model for implementation. Piezoelectric energy harvesting floors could be incorporated into the floors of the student centers as well as in Piezoelectric Energy harvesting the sidewalks along College Ave, for example, in the future.

2. OBJECTIVES OF STUDY :

1. The main objective of the present study is to create electrical energy by using paver block with piezoelectric arrays.
2. To increase the production of electrical energy.
3. The main objective of the present study is to design of paver block for implementation of piezoelectric arrays in paver block.
4. It was felt necessary that the phenomenon of block interaction under applied load needed investigation. Such test could then provide insights into load-spreading ability and other structural characteristics of block pavement.
5. To Generate Renewable Power from human locomotion

3. SCOPE OF STUDY :

The renewable energy sources are those which have infinite source of energy and which are not going to exhaust easily. The mechanical pressure of the piezoelectric discs is used as the input for our system. The power generation through footsteps as a source of renewable energy that we can obtained while walking on to the certain arrangements like footpaths, stairs, plate forms and systems can be install elsewhere specially in the dense populated areas easily.

This study, if embedded in the footpath, can convert foot impact energy into electrical form. The working principle is, when pedestrian steps on the top plate of the device, the plate will dip down slightly due to the weight of the pedestrian. The downward movement of the plate results in compression of the piezoelectric material fitted in the device, to produce electrical energy. An annual consumption of electricity has been increasing rapidly throughout the world. Thus, the usage of electricity increased in the modern day but Power Company generates limited energy. It is difficult to provide power to all consumers. Electrical power management refers to monitoring, controlling the power use in industry, household and commercial sector. There are different limits for both these types of consumers. But consumers are crossing their load limit, due to that it is difficult to provide power to all consumers. Hence we need renewable power generation.

4. METHODOLOGY :

After detailed analysis,we propose the method of piezoelectric crystals to be used in implementing a Power Floor.Let us first have a brief description about piezoelectric crystals. Piezoelectric crystals are special type of crystals which when subjected to pressure produce AC voltage. Also,they exhibit a vice versa phenomenon where when these crystals are subjected to external voltage, they produce mechanical vibrations. The voltage is generated because of formation of dipoles in the material. Equal and opposite charges are deposited on opposite surfaces. This leads to a potential difference between the surfaces which is tapped as electrical energy.

The projections on the tile surface come in contact with the piezo material (yellow) and hence apply force on it. The applied force produces stresses inside piezo material which will produce current. There is clearance of 0.5cm in between the springs (golden) and tile surface (blue) in order to provide free deflection. The spring (golden) is provided for stability as well as protecting the piezo material (yellow) from getting damage by excess load applied. The base plate indicated in green color is fitted inside the frame (grey) firmly to provide support to piezo material while compression. The structure of power generating tile.

1. Literature Survey & its review.
2. Study of piezoelectric materials and power generating floors can be a major application if we use piezoelectric crystals as an energy converting material.
3.Study of foot path construction methodologies.
4. Implementation of piezoelectric energy generating circuit in the footpath.
5. Testing and analysis of energy generation.
6. Cost estimation of project.
7. Report Writing and PPT Preparation.

We propose the method of piezoelectric crystals to be used in implementing a Power Floor. Let us first have a brief description about piezoelectric crystals. Piezoelectric crystals are special type of crystals which when subjected to pressure produce AC voltage. Also, they exhibit a vice versa phenomenon where when these crystals are subjected to external voltage, they produce mechanical vibrations. The voltage is generated because of formation of dipoles in the material. Equal and opposite charges are deposited on opposite surfaces. This leads to a

potential difference between the surfaces which is tapped as electrical energy.

The projections on the tile surface come in contact with the piezo material (yellow) and hence apply force on it. The applied force produces stresses inside piezo material which will produce current. There is clearance of 0.5cm in between the springs (golden) and tile surface (blue) in order to provide free deflection. The spring (golden) is provided for stability as well as protecting the piezo material (yellow) from getting damage by excess load applied. The base plate indicated in green color is fitted inside the frame (grey) firmly to provide support to piezo material while compression. The structure of power generating tile is described.

In proposed method, peltier sensor is additionally use. A thermocouple consists of two conductors of different materials (usually metal alloys) that produce a voltage in the vicinity of the point where the two conductors are in contact. Commercial thermocouples are inexpensive, interchangeable, are supplied with standard connectors, and can measure a wide range of temperatures. In contrast to most other methods of temperature measurement, thermocouples are self-powered and require no external form of excitation. The main limitation with thermocouples is accuracy; system errors of less than one degree Celsius (°C) can be difficult to achieve. Thermocouples for practical measurement of temperature are junctions of specific alloys which have a predictable and repeatable relationship between temperature and voltage. Properties such as resistance to corrosion may also be important when choosing a type of thermocouple.

Where the measurement point is far from the measuring instrument, the intermediate connection can be made by extension wires which are less costly than the materials used to make the sensor. Thermocouples are usually standardized against a reference temperature of 0 degrees Celsius; practical instruments use electronic methods of cold-junction compensation to adjust for varying temperature at the instrument terminals.

Fig. Shows the system model of the power generation and storage. When load is applied on the tile surface (blue) refer fig: it moves in the downward direction.

- The projections on the tile surface come in contact with the piezo material (yellow) and hence apply force on it.
- The applied force produces stresses inside piezo material which will produce current.
- There is clearance of 0.5cm in between the springs (golden) and tile surface (blue) in order to provide free deflection.
- The spring (golden) is provided for stability as well as protecting the piezo material (yellow) from getting damage by excess load applied.

The base plate indicated in green color is fitted inside the frame (grey) firmly to provide support to piezo material while compression.

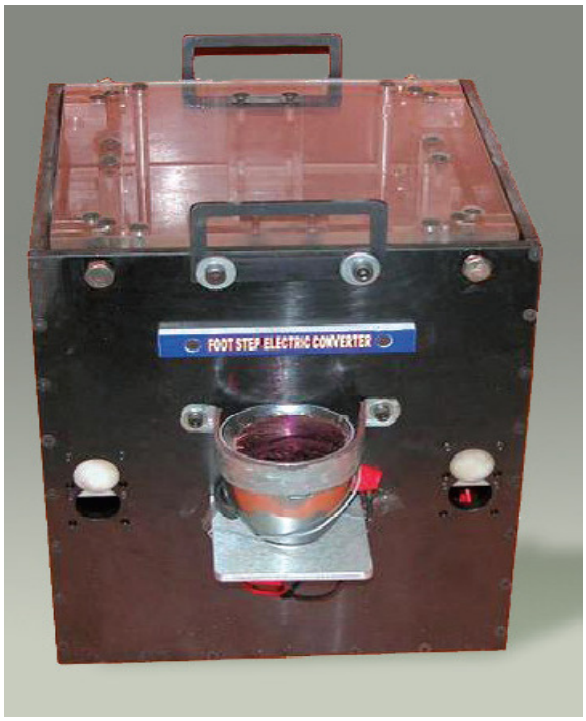

Fig.2. Foot step electric convertor device

5. Steps for construction of footpath

- Planning and Layout
- Calculating Amount of Pavers Needed
- Excavation
- Base Material
- Edge Restraints
- Sand Bedding
- Implementation of Piezoelectric arrays
- LayingBlocks
- Sand Joints
- Sealing
- Maintenance

6. MATERIALS:

Raw Materials

The concrete commonly used to make concrete blocks is a mixture of powdered portland cement, water, sand, and gravel. This produces a light gray block with a fine surface texture and a high compressive strength. A typical concrete block weighs 38-43 lb (17.2-19.5 kg). In general, the concrete mixture used for blocks has a higher percentage of sand and a lower percentage of gravel and water than the concrete mixtures used for general construction purposes. This produces a very dry, stiff mixture that holds its shape when it is removed from the block mold.

If granulated coal or volcanic cinders are used instead of sand and gravel, the resulting block is commonly called a cinder block. This produces a dark gray block with a medium-to-coarse surface texture, good strength, good sound-deadening properties, and a higher thermal insulating value than a concrete block. A typical cinder block weighs 26-33 lb (11.8-15.0 kg).

Lightweight concrete blocks are made by replacing the sand and gravel with expanded clay, shale, or slate. Expanded clay, shale, and slate are produced by crushing the raw materials and heating them to about 2000°F (1093°C). At this temperature the material bloats, or puffs up, because of the rapid generation of gases caused by the combustion of small quantities of organic material trapped inside. A typical light-weight block weighs 22-28 lb (10.0-12.7 kg) and is used to build non-load-bearing walls and partitions. Expanded blast furnace slag, as well as natural volcanic materials such as pumice and scoria, are also used to make lightweight blocks.

In addition to the basic components, the concrete mixture used to make blocks may also contain various chemicals, called admixtures, to alter curing time, increase compressive strength, or improve workability. The mixture may have pigments added to give the blocks a uniform color throughout, or the surface of the blocks may be coated with a baked-on glaze to give a decorative effect or to provide protection against chemical attack. The glazes are usually made with a thermosetting resinous binder, silica sand, and color pigments.

Cement

Ordinary Portland Cement (OPC)of 43 grade was used throughout the course of the investigation. The physical properties of the cement as determined from various tests conforming to Indian Standard IS: 1489 1991.

Aggregates

Aggregates are those chemically inert materials which when bonded by cement paste form concrete. Aggregates constitute the bulk of the total volume of concrete and hence they influence the strength of concrete to great extent. The properties of concrete are directly related to those of its constituents and as such aggregate used in a concrete mix should be hard, strong, dense, durable, free from lumps of clays, loam, vegetable and other such foreign matter. The presence of all such debris prevents adhesion of cement on the surface of aggregates and hence reduces the strength of concrete. The aggregates are classified into two categories:

Fine aggregates:

The material which passed through I.S. Sieve No. 480 (4.75mm) is termed as fine Impact factor 1.472 Aggregates. Function of fine aggregates is to make concrete dense, by filling voids of coarse aggregates, reduces the shrinkage of cement and makes an economical mix. Natural sand or crushed stone dust is used as a fine aggregate in concrete mix. Sand may be obtained from sea, river, lake or pit, but when used in a concrete mix, it should be properly washed and tested to ascertain that total percentage of clay, silt, salts and other organic matter does not exceed specified limit. Sand as obtained from the above sources may be round or angular in grains. Angular grained sand has good interlocking property which results in a strong mix while rounded grained sand does not afford sufficient interlock in the matrix.

Coarse Aggregates:

The material whose particles are of such size as are retained on I.S. Sieve No. 480 (4.75mm) is termed as coarse aggregates. Coarse aggregates, like fine aggregates, must consist of sound durable inert particles to make the concrete strong and weather resistant. It should be free chemicals or coating or clay or other fine material that may affect bonding of cement paste. The size of the coarse aggregates used depends upon the nature of work. Crushed hard stone and gravel are the common materials used as coarse aggregates for structural concrete. Coarse aggregates are usually obtained by crushing granite, gneiss; crystalline lime stone and good variety of sand stone etc. as far as possible flaky and elongated pieces of stone should be avoided.

Water: -

The water used for mixing concrete mix should be potable drinking water having PH 6 TO 8.

7.CONCLUSION :

Promoting energy awareness is an integral part of this proposal. A piezoelectric floor generates electricity through the deformation of the material under a load. Due to the high foot traffic of the campus center throughout the weekday, the energy harvested potential and energy awareness can be recognized.

Energy generation source must be something easily implemented and utilize property that is already developed. Both of these issues are successfully addressed by the installation of piezoelectric floor tiles. We can save lot of electricity required for street lamps through this project.

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