



THE WALL-MAGAZINE OF CE DEPARTMENT DSCSITSC



Theme- **KINETIC FOOTFALL**

KINETIC FOOTFALL IS SUITABLE AND GREEN ENERGY SOURCE THROUGH POWER GENERATION FROM THE HUMAN FOOTSTEPS BY AVOIDING THE RAPID DEPLETION OF THE MAIN FOSSIL SOURCE OF ENERGY (OIL).

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Energy
saving



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ABSTRACT

- DUE TO THE RAPID DEPLETION OF THE MAIN FOSSIL SOURCE OF ENERGY (OIL) IT IS VITAL TO SEARCH FOR OTHER SOURCE OF ENERGY. ONE SUITABLE AND GREEN SOURCE OF ENERGY IS THE POWER GENERATION FROM THE HUMAN FOOTSTEPS. THIS SEARCH WORK AIMS TO DESIGN AND TEST A SAMPLE DEVICE THAT CONVERTS THE KINETIC ENERGY OF THE HUMAN FOOTSTEPS TO ELECTRICAL ENERGY.



FOOT IMPACT

- **FIRST STAGE-** STUDYING AND ANALYZING THE RESULTING FORCE OF THE FOOTSTEPS DUE TO HUMAN WEIGHT UNDER ALL CONDITION EQUATIONS AND AMOUNT OF FORCE, WEIGHT OF PEDESTRIAN, WEATHER CONDITION ETC.
- **SECOND STAGE-** DESIGN A SUITABLE MECHANISM TO TRANSFORM THE RECIPROCATION MOTION OF FOOTSTEPS INTO RATIONAL MOTION.
- **THIRD STAGE-** STUDY THE TYPE OF ELECTRICAL GENERATOR OR THE DC GENERATOR WHICH ARE ECO FRIENDLY TO NATURE AND THE GENERATORS POWERS & MALL LED FOR DEMONSTRATION.



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WORKING PRINCIPLE

Step 1

When the piezoelectric material is compressed, the atoms press together enough to change the properties of electrons

Step 2

When the pressure is removed the electrons return to their original shape.

Step 3

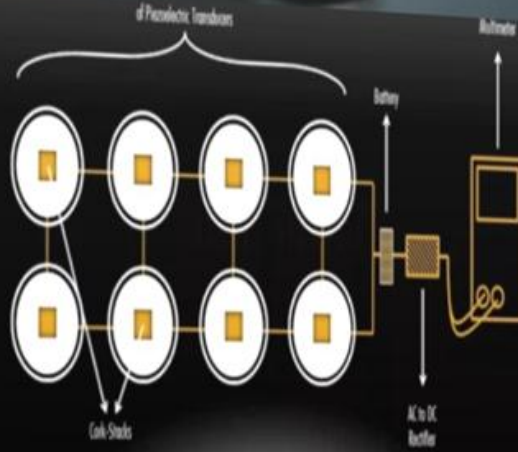
The compounds are fitted with an auxiliary circuit, then the returning electrons will be captured and used to create a micro-circuit

Step 4

When humans start to walk on the floor, the pressure developed on the floor

Step 5

The pressure or kinetic energy will be collected by the piezoelectric compounds of the floor and later the kinetic energy converts into electrical energy and stored in battery.



MATERIALS USED

- Piezo Electric Sensors
- Gear
- Rack
- Shaft
- Generator Motor
- Chargeable battery
- Jumper Wires
- Joints & Mounts
- Base Frame
- Connecting Rods
- Screws & Bolts



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INSTALLATION

Select a Suitable Location

Fit on a Tile (Standard 30 cm x 30 cm size) consists of rubber mat, acrylic and piezoelectric transducers.



Acrylic plates was placed to ensure uniform pressure distribution along the tile. The piezoelectric transducer was connected in parallel and series to a PCB plates surrounding the tile.

At the end of connection pair of wires are wired to rectifier circuit so as storage capacitor.

Then low power load such as LEDs are used to proof that the system work.

ADVANTAGES

- ❖ Tiles are completely Renewable, Ecofriendly and Sustainable technology.
- ❖ Approximately 6.817 tons of excessive CO₂ emissions can be reduced everyday by this process.
- ❖ The top surface is build entirely of recycled materials and maintenance cost is very less.
- ❖ These tiles can be used indoors or outdoors in high traffic area and generate electricity from pedestrian footfall.
- ❖ Harvesting human power to produce energy is the best practice in order to fulfill the energy demand for future. Moreover it is water proof and damp proof.

DISADVANTAGES

- ❑ Low amount energy produced during each step or movement of the slab.
- ❑ Installation cost is extremely high and also have uncertainty about economic life.
- ❑ It can not be used as primary energy source.
- ❑ In India market acceptance and investments are the main issues.
- ❑ Peoples awareness and interest about this type Renewable, Sustainable & futuristic technology is very less.

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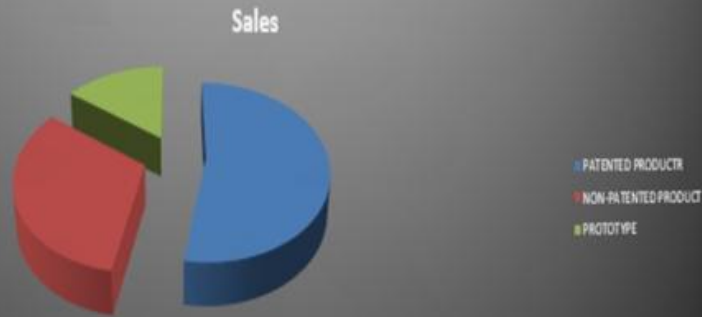


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MARKETING

- There is a steep rise in the patent filing trend during 2011-2012, due to increasing focus on the research and innovations in the footfall energy harvesting sector. Companies such as General Electric and East Japan Railway Company are keen in developing their prototypes. A comparative percentage of details about the products and prototypes are given below



- Every city around the world has a huge growing population and public places like airports, railway stations, and commercial complexes receive huge amount of footsteps throughout the day, thus making them suitable for energy harvesting floors.

ESTIMATION

- Flexes by 5mm when stepped on, resulting in up to 8 watts of kinetic energy over the duration of the footstep.
- Every step is good for about 3 joules of energy, which could light a LED streetlamp for 30 seconds.
- The footfall lit up 176 light panels embedded in its walls and generated over 100,000 joules of energy within the first 3 days.

• Battery costs

Purchase cost= $\$13/\text{kWm} \cdot 250\text{kW} \cdot 10$
minutes= \$32500
Installation cost= $\$30/\text{kW} \cdot 250\text{kW} = \7500
Total initial capital cost= \$40000
Capital replacement cost every four= \$40000
Annual maintenance cost= $\$2.25/\text{kWm} \cdot$
 $250\text{kW} \cdot 10$ minutes
Annual floor space cost= $0.22\text{ft}^2/\text{kW} \cdot 250$
 $\text{kW} \cdot \$10/\text{ft}^2 = \550
Annual standby power consumption cost=
 $250\text{ kW} \cdot 8760\text{ hours} \cdot 0.01\% \cdot \$0.063/\text{kWh} =$
\$14

• Flywheel costs

Purchase cost= $\$200/\text{kW} \cdot 250\text{kW} = \50000
Installation cost= $\$30/\text{kW} \cdot 250\text{kW} = \7500
Total initial capital cost= \$57500
Bearing replacement cost every five years=
 $\$10/\text{kW} \cdot 250\text{kW} = \2500
Vacuum pump replacement every seven
years= $\$5/\text{kW} \cdot 250\text{kW} = \1250
Annual floor space cost= $0.08\text{ft}^2/\text{kW} \cdot 250\text{kW}$
 $\cdot \$10/\text{ft}^2 = \200
Annual standby power consumption cost=
 $250\text{kW} \cdot 8760\text{ hours} \cdot 1\% \cdot \$0.063/\text{kWh} =$
\$1380

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Editorial conclusion

- ❖ *The resource and energy crisis in the world has necessitated a radical shift among policy makers and industry participants to reduce reliance on fossil fuels.*
- ❖ *It is recognized that Kinetic footfall is currently a wasted energy resource and presents a significant opportunity for the renewable energy generation.*
- ❖ *From the above study it can be stated that harvesting kinetic energies is a sustainable method for generating electricity without depleting natural resources.*
- ❖ *By comparing the harvesting energy technologies located on the body and pavement, it is revealed that for body located harvester the power output depends on the physiological parameters so it should have be taken care while the application of the technology.*
- ❖ *In the time of rapid globalization and excessive pollution made through this, the kinetic footfall balance the modernization with nature by reducing carbon footprint in a significant manner and also balance the energy audit perfectly.*