

PIEZO-POWER FROM FOOTSTEPS

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ABSTRACT:

Electricity plays a vital role in the environment widely. Many methods are adopted for the production of electricity by using renewable and non-renewable energy resources. These resources are diminishing day-by-day in addition to that global warming has increased and environment has been highly polluted. Hence we need some clean sustainable energy to protect the environment and to avoid the interruption of power cuts. The main aim of our project is to improve the method of power generation. The implementation of the project is that to produce power by using the self weight of the person translates into clean sustainable electrical energy

By proposing this technology, power is generated by human location which can be laid in super markets, high schools, universities, playground, commercial buildings etc. We prefer these places because they are crowded with people that would have huge mass. Hence the device translates the kinetic energy generated by huge mass of people into electricity, then the electricity stored and used later.

Keywords: Piezo electric transducer, Piezo electric effect, pressure, alternating current, direct current, Bridge rectifier, capacitor, resistor,

1.INTRODUCTION:

Now-a-days generation of electrical energy has become a more vital factor in the power system because of the incremental demand day-by-day with the population growth in the Electrical Distribution System. Even though power generation can be done in many

different ways, this technique is unique because electrical energy is generated using piezo sensors based on the principle of Piezo Electric Effect. The word Piezo is derived from the Greek "Piezein" which means to press or squeeze. Due to the increase in population growth, energy consumption has been increased which leads to the shortage of non-renewable energy resources. To overcome this, electricity is generated using this renewable resource.

2. SCOPE OF THIS PROJECT:

This project has been implemented to overcome all the drawbacks of renewable energy resource such as hydraulic energy, wind energy, solar energy, geothermal energy etc. In hydraulic energy we can produce current only when the height of water fall and flow of water is available. In solar energy we can save power source only at the arid regions. Likewise in wind energy, we can produce current only in the heavy wind flow regions. But in the case of piezoelectric current we can generate power in any environmental condition without fail. This technology is very efficient and ecofriendly method. It does not cause any harm to the environment as emission of CO₂ is highly reduced. So the ozone layer depletion will be reduced.

3. WORKING PRINCIPLE:

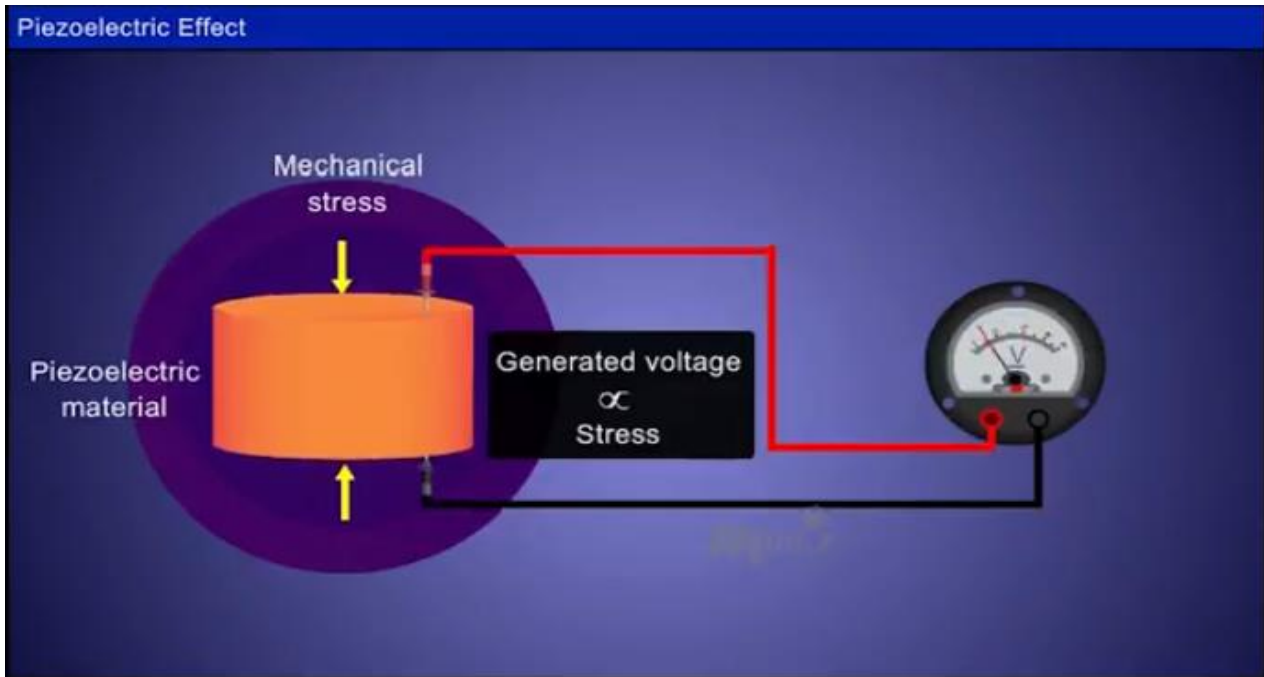
3.1. Piezoelectric principle:

Piezoelectric effect is the ability of certain materials to generate an electric charge in response to applied mechanical stress. Piezoelectric materials

produces electricity when a force is applied that changes their shape in some way. When an amount of pressure is applied to the quartz crystal, voltage is produced by changing charge created by the moving electrons.

Piezoelectricity is defined as the change in electric polarization with the change in applied stress. In the absence of external strain, the charge distribution is symmetric and the net dipole moment is zero. When an external stress is applied the charges will be displaced and the charge distribution will be no longer symmetric and the net polarization is created. This can cause the change of electric charge due to the uniform change in the temperature and produce electric field which in turn produce electricity

3.2. PIEZOELECTRIC EFFECT:

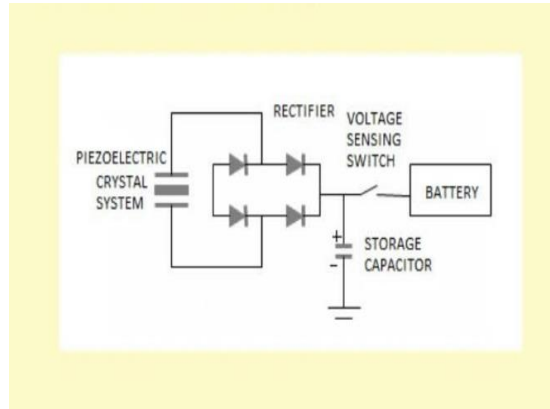


3.3 WORKING PRINCIPLE

It works on the principle, that when we step on the floor or pavement our kinetic energy squeeze the piezoelectric material fixed under the floor, the positive and negative charges separated and dipoles orderly arranged due to mechanical stress from our footsteps. Piezomaterials such as quartz, lead zirconate titanate, topaz, ceramics, polymers, Rochelle salt etc are used. The pressure or vibrations caused from our footsteps is fed as an input to the transducer. The working of transducer is to convert one form of energy into other form of energy. Transducer produce the input as an alternating current. After that by using bridge rectifier we can convert alternating current into direct current which can save in battery for later use or for immediate usage, current capacitor is used. To reduce current flow, adjust signals, and to divide voltages for the required purpose, resistor is used. For better efficiency of this technology in highway, The rectifier bridge is sealed with electronic glue to prevent the short circuit

caused by water leakage. Stainless steel gasket is used to prevent stress concentration and also it gives better performance in fatigue resistance, waterproof performance, good compression performance. If Greater stress is applied, greater power will be produced. This technology is efficient only in the place of overcrowded areas. If the energy harvesting is very low, nano wires or micro watts can be used as a trigger for self powered sensors that tracking the users and control all equipment depend on their movement. Piezo sensors also can be used instead of piezoelectric transducers for producing electricity. Voltage generated by a single tile can be displayed on display devices like LCD located at the different location using zigbee technology for smart analysis.

CIRCUIT DIAGRAM



4.COMPONENTS:

Components used in this piezoelectric transducer are as follows:

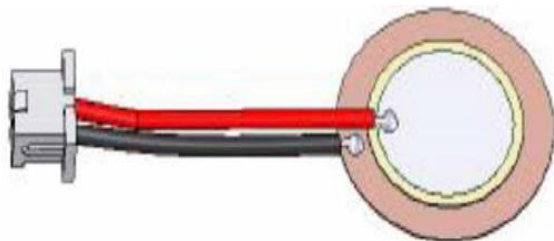
- Piezoelectric transducer
- Bridge rectifier
- Capacitor
- Lithium ion battery

4.1.PIEZOELECTRIC TRANSDUCER:

Piezoelectric materials are materials that produce an electric current when they are placed under mechanical stress. There are several materials that possess piezoelectric properties are crystals (eg. Quartz) and ceramics (eg. Lead zirconate titanate).

A transducer is an electrical device which is used to convert one form of energy to another form. In general, these devices deals with different types of energies such as mechanical energy, electrical energy, light energy, chemical energy, thermal energy, acoustic energy, electromagnetic energy.

In piezoelectric transducer, piezoelectric material is inbuilt with the piezoelectric metal plate.



4.4.BRIDGE RECTIFIER:

A bridge rectifier is a converter that converts alternating current to direct current that rectifies main AC input to DC input.

4.3.CAPACITOR:

The capacitor is a component which has the ability or capacity to store energy in the form of an electrical charge producing a potential difference across its plates, much like a small rechargeable battery.

4.4.LITHIUM ION BATTERY:

A Lithium-ion battery or Li-ion battery is a type of rechargeable battery in which lithium ions move from the negative electrode to the positive electrode during discharge and back when charging.

4.5.WORKING PRINCIPLE OF TRANSDUCER:

The piezoelectric transducer work on the principle of piezoelectric effect. When mechanical stress or forces are applied to some materials along certain planes, they produce electric voltage. The voltage output obtained from these materials due to piezoelectric effect is proportional to the applied stress or force.

CONCLUSION:

From this project, we conclude that by using natural renewable resources, power can be generated. There is no need of fuel. This electrical energy is supplied for various purposes such as charging of laptops and mobile phones. It can be laid in pavements, roads, football ground and also infrastructure projects. The efficiency of this technology depends on the number of people passing over that pavement and axle load from the vehicles moving on them whereas in football ground the pressure given by the players while running on them or hitting the ball on the ground. For developing countries with more population, energy management is a big challenge. It can also be used in rural areas where power availability is less or totally absent. More research is underway to increase efficiency, optimality and durability of the device under varying conditions and for the suitability of the technology for the mass development and commercialization of the equipment.

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