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Energy Harvesting from Piezoelectric Material as an Eenvironmental Friendly

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Abstract:- Present modern era of world (especially India) is dependent extremely on non-renewable source of energy such as thermal,nuclear energy to provide electricity for its natives, so It is clear that non-renewable energy sources do not support sustainable development. Therefore, the best solution is a renewable energy source, but it is very present in nature and some can be damaged, so you can choose a piezoelectric material. In the material, some charge is generated on the surface as a result of the application of mechanical stress. The effect charge is proportional to the mechanical load. This is called the direct piezoelectric effect. The material also shows this phenomenon in reverse and has a measurable charge in proportion to the applied electric field. We hope that our readers will learn the goal of generating future free energy from piezoelectric materials.

Keyword:- *Piezoelectric Material, Pb-Free Piezoelectric, Electromechanical Coupling Factor.*

I. INTRODUCTION

Energy is obtained from renewable energy sources, available in nature. This energy is regenerated according to the human timeline such as sun, wind, water waves. The generated renewable energy is regularly used in various sectors such as electricity generation, transport and rural energy services.

➢ *Renewable Sources*

Solar power Only works when the sun is rising. We need a large vacant lot. High maintenance costs. Geo Thermos: Toxic gas release Initial investment is heavily dependent on water, which is too high. Hydro power Emits a large amount of CO2 and methane. The area around the dam has deteriorated. It disturbs the ecological balance near the dam. Inefficient biomass yield. Ethanol is used in hazardous machinery. Methane escapes and pollutes the environment. Store only when the sun is out. Ask for a large vacant lot. High maintenance costs.

II. PIEZOELECTRICITY MATERIALS

Because piezoelectric fabric property indicates piezoelectric effect. This piezoelectric action indicates that, "whilst mechanical pressure is implemented at the Piezo crystal, the AC voltage is produced throughout it". In addition, it has undergone an opposite voltage effect known as an anti-piezoelectric effect, where, while electrical discipline is practiced, vibrations are generated inside the device. And when it applies to piezo crystals, the process of converting the magical and evil bases into crystals will take place, which is the end result of the powerful throughout and reverse electrical discipline, the electrical discipline. the outside stretches or compresses the piezoelectric fabric When a person walks. or run on the floor then his weight applied to the floor level will give a moderate shear force to the top level of the tile.This shift from equilibrium state, ends in accumulation of rate on contrary ends and subsequently produces a voltage among the wonderful and the bad plate. Piezoelectric transducer.

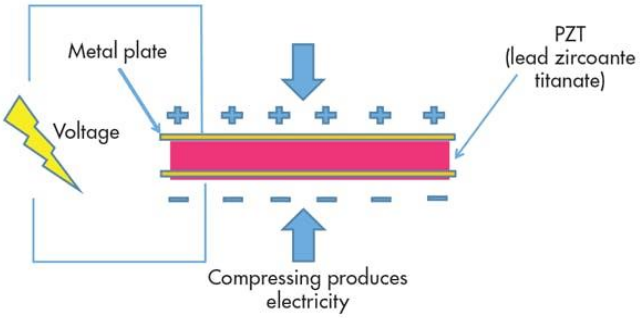

Fig 1. Piezoelectric effect

Hence, we infer that better the inner resistance of a cell, decrease is its cutting-edge flowing capacity. Thus, we join the cells in parallel to lessen the whole resistance to minimum. Secondly, It may be visible from the graph that the voltage from a chain connection is right however the cutting-edge received is poor, while the cutting-edge from a parallel connection is right however the voltage is poor. But this trouble is rectified in a chain- parallel connection wherein a very good voltage in addition to cutting-edge may be received.

III. THE HISTORY OF PIEZOELECTRICS

All matter has a life cycle, defined by four "external" environmental forces, which can be summarized under the abbreviation STEP (social/cultural, technological, economic and political forces). treatment).We will first observe how these forces encourage / discourage the growth of piezoelectric materials.

➢ *Dawn of Piezoelectricity*

The Curie brothers (Pierre and Jacques Curie) discovered the direct piezoelectric effect in single-crystal quartz in 1880. Under pressure, quartz produces magnetic charges/stressed quartz and objects whether other. The root of the word "piezo" means "pressure" in Greek; therefore, the original meaning of

the word piezoelectric included "voltage". On the other hand, materials exhibiting this phenomenon also exhibit geometric distortion proportional to the applied electric field. This is the inverse piezoelectric effect, discovered by Gabriel Lippmann in 1881.

Realizing the connection between the two phenomena helped Pierre Curie develop pioneering ideas about the fundamental role of symmetry in theorems. bodily law. Meanwhile, the Curie brothers placed their discovery into exercise through designing a piezoelectric quartz galvanometer, able to measuring small currents; This helped Pierre`s wife, Marie Curie, twenty years later in her first research. At 11:forty five a.m. on April 10, 1912, the tragedy of the sinking of the Titanic occurred. As readers know, that is because of an iceberg hidden below the sea. This might have been prevented if ultrasonic sonar structures were evolved on the time. Due to this tragic incident (social force) become prompted to increase the improvement of ultrasonic era the usage of piezoelectricity.

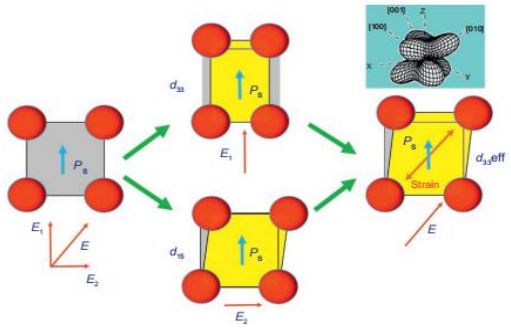

Fig 2. Intuitive principle model for understanding piezoelectric enhancement as a function of crystal orientation in iron perovskite.

- *Pb-Free Piezoelectric*

The modern century is called the present century of the Anno Domini era or the common era. We are facing serious global problems such as accumulation of toxic waste, greenhouse effect on earth, pollution of rivers and seas, lack of energy and oil sources. and natural gas. In 2006, the European Community restricted the use of RoHS (the use of certain hazardous substances), especially lead (Pb) in electronic devices. Therefore, in the future, it may be necessary to adapt the use of the most famous piezoelectric ceramic, lead zirconate titanate (PZT). Government regulations on the use of PZT could come into force in Japan and Europe within the next 10 years. JSP appears to be a significant threat to piezoelectric companies that only manufacture PZT piezoelectric ceramics.

However, this also creates an opportunity for companies to prepare alternative piezo ceramics for the piezo device market. Development of lead-free piezoelectric (Pb) ceramics began after 1999. Lead-free piezoelectric ceramic. The ratio of works and patents of bismuth compounds (layered bismuth and (Bi, Na) TiO3) exceeds 61%. This is because bismuth compounds are easier to produce than other compounds. Note that the maximum strain is up to , which is the PZT strain.

➢ *Composite Effects*

Kitayama and Sgawara, Nippon Telegraph and Phone, Report on Piezoceramic: Polymer Composites on the IEEE Japan convention in 1972, regarded because the first paper on piezoelectric composites. As stated above, their paper is handled with a artificial quroleum cloth fabricated from PZT and PVDF powder, and that they suggested thermoelectric and thermoelectric properties. The flexibility is just like PVDF, however piezoelectric performance is better than PVDF, which derives from PVDF`s contribution. piezocomposite field. In a few cases, the common fee of the composite output exceeds the 2 outputs of length 1 and length 2. Consider distinct outputs, y and z, for 2 periods (i.e. Y1 , Z1; Y2, Z2). When the coefficient of product (FOM) of an impact is given as a fraction (Y/Z), possible assume an first rate impact. Assume that Y and Z obey the impact of general concavity and general convexity, respectively, as proven in Fig. 1,2; mixed Y/Z values will display a top on the intermediate segment ratio, i.e. the common FOM is greater than the FOM of the remaining element (Y1/Z1 or Y2/Z2). This is referred to as the “mixture impact”. Newnham's organization investigated numerous piezoceramic/polymeric junction composites, displaying the mixed feature of g (the piezoelectric voltage constant); that is furnished with the aid of using d / 0ε (d: piezoelectric pressure constant, and ε: desirable relative coefficient), in which d and ε obey the sum of concave and convex effects.

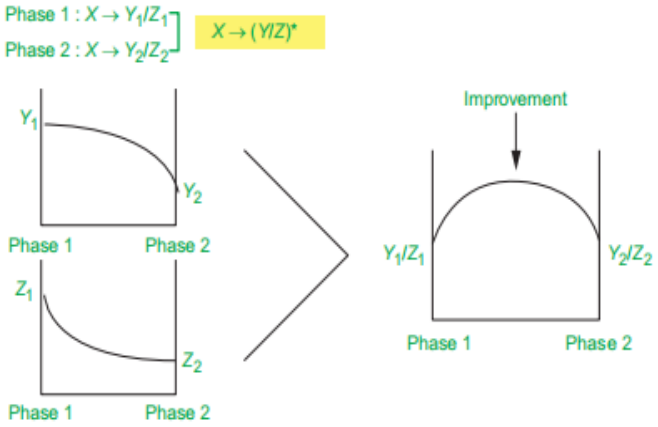

Fig 3 Basics of improving the performance of a combination through a combined effect.

There are 3 major steps concerned in piezoelectric strength capture:

- Mechanical strength transfer: this consists of the mechanical balance of the piezoelectric transducer beneathneath excessive strain and appropriate mechanical impedance
- Mechanical strength transfer: This entails electromechanical coupling factors withinside the composite shape of the transducer.
- Electrical strength transfer: consisting of electric impedance matching, DC/DC converters for strength garage in capacitors or rechargeable batteries

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IV. LITERATURE SURVEY

Select city walk mall
Saket, New Delhi
India total are 120000sq.m

Address: A-3,Saket District Centre,
District Centre, Sector 6, Pushp Vihar,
New Delhi, Delhi 110017

FOR AN AREA OF JUST 250 sq.m	
Area Covered	250 sq.m
Average football	People 35000
People Around 70% of the people step an our tiles	
Effective Footfall	24,500
An average person walks 250 steps in an area of 250 sq.m	
Total Steps	24500 x250 = 6125000steps
One Step Generates	2.73x 10 mW
Total Energy	612500.3x 2.73mW=16721.25W
Power Produced	1672125x10 =167.25kWh
Efficiency of Tiles 70%	
Output Power	117.075 kWh

FOR AN AREA OF JUST 250 Sq.m
Cost of Electricity/ Unit Rs. 8
Cost of electricity produced by Tile 117.075x8=Rs 936.6 per day
Per month 936.6x30=Rs 28098
Per year Rs 337176
FON FIFE ENTINE AREA OF 120000Sq.m
Electricity saved in one Day Rs. 936.6x 480= RS 4,49,280
1 Month Rs. 4,49,280x480=Rs 1,34,78,400

From producing 2.734 x 10m W to helping a moll save Rs.16,17,40,800 p.a, Piezoelectricity is definitely the modem day fuel.

However, no matter how heavy the coin might be, it always will have two sides. Similarly, even piezoelectricity has some threats and weaknesses.

V. APPILICATIONS IN FURURE

Railway Stations, shopping malls, football fields Densely populated public, Roadways,

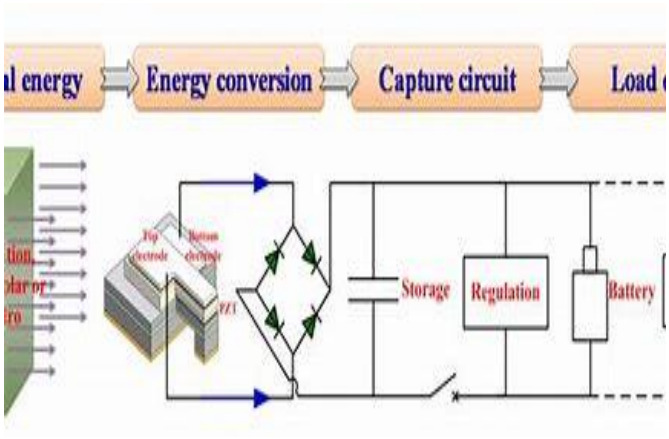

Fig 3. Piezoelectric energy harvesting

Normally, the output impedance of the electrical energy obtained by the piezoelectric converter is very high, so the electrical impedance mismatch greatly reduces the efficiency of charge accumulation in the rechargeable battery. OK, typically low impedance from approximately 10 to 100 Ω. To overcome this problem, switch shunts are often used for energy harvesting purposes. A DCDC step-down converter has been designed for the above cymbal system, which converts 50 mW of power over 60 mW of the cymbal (82) into a low impedance load of 5 kΩ, with a 2% cycle rate duty cycle and switching frequency 1 kHz. Another unique circuit design could be with a piezoelectric transformer. The piezoelectric transformer used in the circuit has a low output impedance of about 50 Ω, and the transformer efficiency of the resonant transformer exceeds 95%. This low output impedance is combined with an impedance matching the load (rechargeable battery).

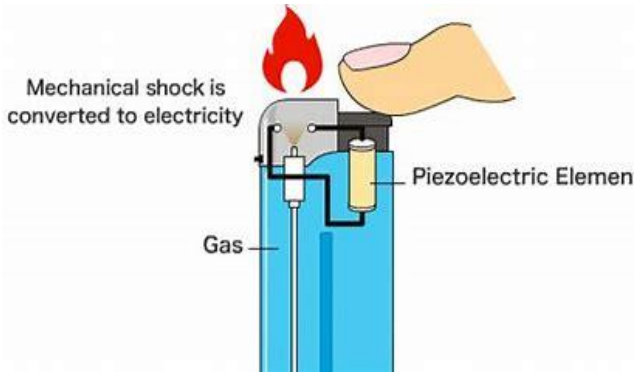

Fig 4. As Piezoelectric element works in lighter

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VI. RESULT

Since the current generated by the piezoelectric transducer is alternating current, it is not possible to operate home appliances. To generate a constant DC current, the passes it through a rectifier. The rectifier converts AC to DC and provides available power. Available. Prove that AC current is generated when connected from the multimeter without additional circuitry. The rectifier, reading, shows a negative sign, but if the rectifier is placed between the readings, the reading changes to a positive value. Cork and its meaning

Pressure = Force / Area
Stress = Force / Area
P = M / A
P is proportional to 1 / A

So, when walking on a board without a stack, the applied pressure is evenly distributed and generated. increase. Less shear; however, walking on a board with cork posts concentrates the applied pressure on the transducer, causing potential differences and maximum shear. People who weigh different from 40 kg walk on the piezo panel and test the ability of the piezo panel to generate voltage. Therefore, statistically, a maximum voltage of 40V is generated at the point. When the floor panel weighs 75 kg, the panel is clamped. Therefore, according to the unified method,

V 12μA
1V 12 / 7μA
40V (12/7) * 40
68.35μA = 68.35x10 ° A

Therefore,
power = VxI
capacity = 40 x 68.35 x 10
power = 2.734 x 10 W

Therefore, the energy is generated by the infinitely small step and requires a constant power supply to keep the device running. Therefore, the battery looks like this: Used to store power**.**

VII. CONCLUSION

This material is tested and implemented in practice to charge phone and electric vehicle charging stations using Piezo sensors, providing average voltage and power. Therefore, this device helps to save the cost of supplying electricity to people. Moreover, this device is used by farmers in their daily work, they can be recharged according to their needs, and can also be used to light torches when working at night.

FUTURE SCOPE

The electricity generated by Piezo generators is an eco-friendly and free source of electricity everywhere.

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