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Vellore Institute of Technology

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INTRODUCTION TO INNOVATIVEPROJECTS

Final - Report

Generation Of Clean Energy UsingPiezoelectric Generator

TEAM MEMBERS

1. KARMALI ZIYAN AARIF 18BCI0272
2. ARPITA BASU 18BCL0039
3. KRITHIKA VYAS 18BCL0126
4. KASARAGADDA TARUN SAI CHOWDARY 18BEC0052
5. VANUKURU NAGA SAI CHARAN 18BEC0145
6. BOMMISETTY SREE HARSHA 18BEC0251
7. VINNAKOTA VENKATA RATNAM NAIDU 18BEC0425
8. SHREYANSH SRIVASTAVA 18BEC0438
9. DEVANSH SHUKLA 18BEC0486
10. SHASHANK AGRAWAL 18BEC0490

INTRODUCTION

OBJECTIVE

Our main aim is to produce light out of the force or stress applied on the piezoelectric sensor. This can solve many problems regarding the dependency on the replenishing sources of energy, by harvesting energy,since the world is in need of energy.

This produced light could be the solution for:

1. Growing need for renewable sources of energy,
2. Reduce dependency on battery power,
3. Lights can be used in automobiles, footwear, etc...

Today, the energy harvesting from light, thermal, magnetic or mechanicalenergy in the ambient environment is an important research topic. Withrecent progresses in wireless, sensor systems are being popularly used in various areas, including human body care, bridge or engine early health monitoring etc.

However, replacement of small power supplies and batteries in sensor systems would be a tedious task. Therefore, it is quite interesting to supply a small amount of power for sensor systems from environmentalenergy.

In addition, because of the shortage in energy sources, people are also seeking environmental energy to replace part of the electric energy usedin daily life. Therefore, another interesting application is to harvest the mechanical energy from highway or railway for generating electric energy, which may supply a small to medium amount of power for powering road lights or even electric motors if there are enough vehicles/trains running.

One of the most effective methods for power harvesting systems is to usepiezoelectric materials to convert mechanical vibration or strain energy to electric energy based on the piezoelectric effect. During the past ten years, there has been explosion of research in the area of harvesting energy from ambient vibrations by using the direct piezoelectric effect.
Piezoelectric materials are very good prospects for mechanical energy conversion because they have a good electromechanical coupling effect.

Piezoelectric energy harvesting devices are also much simpler than, forexample electromagnetic or electrostatic devices.

For these reasons, piezoelectric energy harvesting devices have attracted much attention. Conventional piezoelectric harvesting devices are based on a piezoelectric unimorph or bimorph cantilever configuration i.e., one or two piezoelectric elements laminated with one long elastic plate, and they are operated in bending mode. In general, piezoelectric cantilever type harvesters generate only a very small poweroutput, and they cannot work under pressure.

In 2004, Uchino's group at Pennsylvania State University developed a Piezoelectric cymbal transducer which operated in flex tensional mode for vibration energy harvesting, which could work well under a small force load.

PIEZOELECTRIC EFFECT

There are certain materials that generate electric potential or voltage when mechanical strain is applied to them, they tend to change their dimensions. This is called piezo electric effect.

This effect was discovered in the year 1880 by Pierre and Jacques Curie. The piezoelectric transducers 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 effectis proportional to the applied stress or force.

NEED OF ENERGY HARVESTING

- Growing need for renewable sources of energy
- Proposes several potentially inexpensive and highly effective solutions
- Reduce dependence upon battery power
- Complexity of wiring
- Increased costs of wiring
- Reduced costs of embedded intelligence
- Increasing popularity of wireless networks
- Limitations of batteries
- Reduce environmental impact

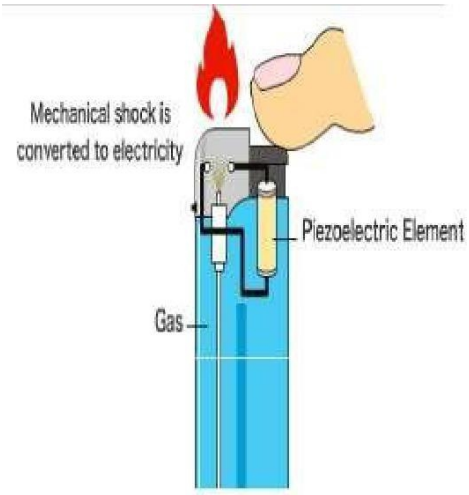
Piezoelectric Cell

The piezoelectric cell is what allows us to convert the mechanical energy to electrical energy thus, utilizing our wasted energy. The piezoelectric inputsthe energy from the input signal and outputs the signal to our circuit system.We will buy this component as it is too physically advanced for us to construct and we do not have the tools to construct it.

APPLICATIONS:

Lighter

Pressing the button causes a spring-loaded hammer to hit a piezoelectric crystal, producing a sufficiently high voltage electric current that flows across a small spark-gap, thus heating and igniting the gas.

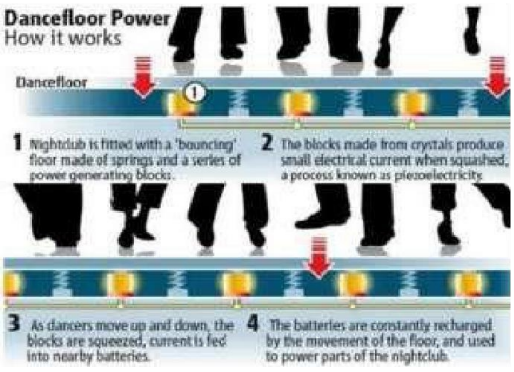


Armed Forces

The armed forces toyed with the idea of putting piezoelectric materials insoldier's boots to power radios and other portable electronic gear.

Night Clubs

Several nightclubs, mostly in Europe have already begun to power their strobes and stereos using the force of hundreds of people pounding on piezoelectric lined dance floors.



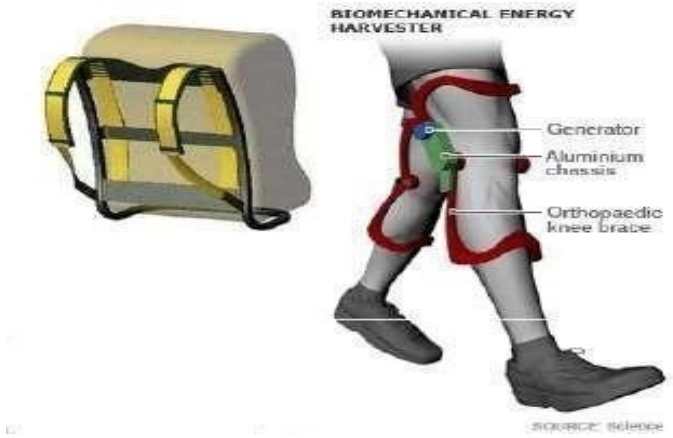
Gyms

Several gyms, notable in Portland and a few other places are powered by acombination of piezoelectric set ups and generators set up on stationary bikes.

Piezoelectric Powered Music Instruments

Harvesting From Human Body

Capitalizing on the friction and heat created by walking, running and even justwearing jeans, engineers from Michigan Technological University, Arizona State University devised a way to use this type of generated energy to chargeportable electronic devices, like iPods and mobile phones.



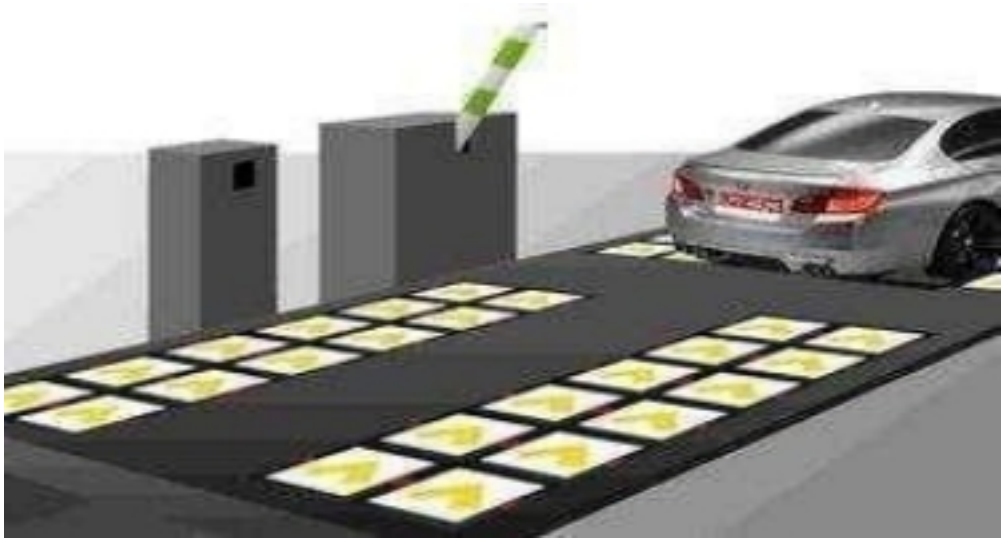
Piezoelectric road harvests traffic energy to generate electricity

Public Areas

Blocks that light up when activated entice people to step on them. Put a few at each shopping mall and you have a playground that lets kids burn off their excess energy and turn it into electricity. Set them up in front of the stage at a Phish concert and you might generate enough electricity to power the amps during one of Trey Anastasia's guitar solos. (Okay - maybe that one is a little ambitious.)

But it's not just a high-tech toy. Energy Floors recently partnered with the Russian Railway Research Institute, which hopes to put Energy Floors on railroad platforms and high-traffic walkways.

They'll also investigate the use of this technology to harvest energy from themovement of cars and trains. Frankly, I think piezoelectric transducers mightbe better for those applications. They're less efficient than electromagnetic generators, but they might be more durable under heavy vehicular traf



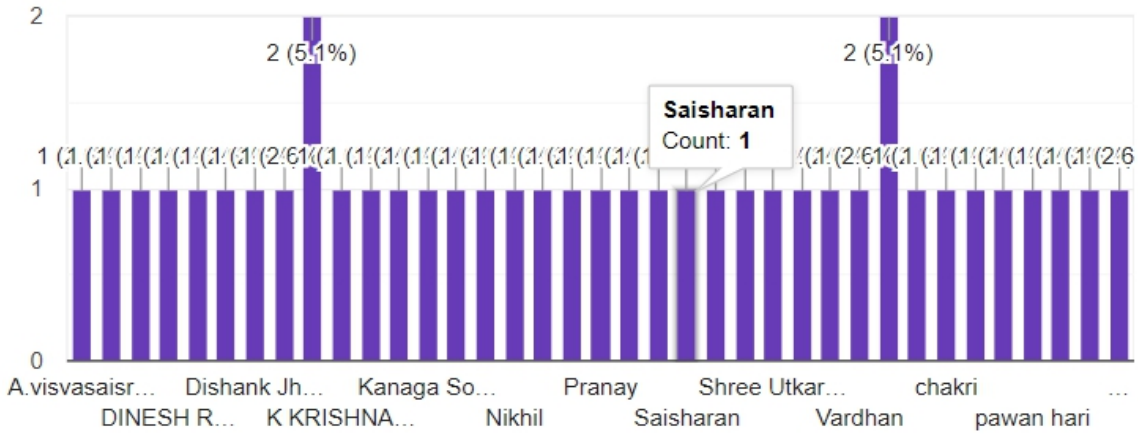
Survey:

Clean Energy Generation

39 responses

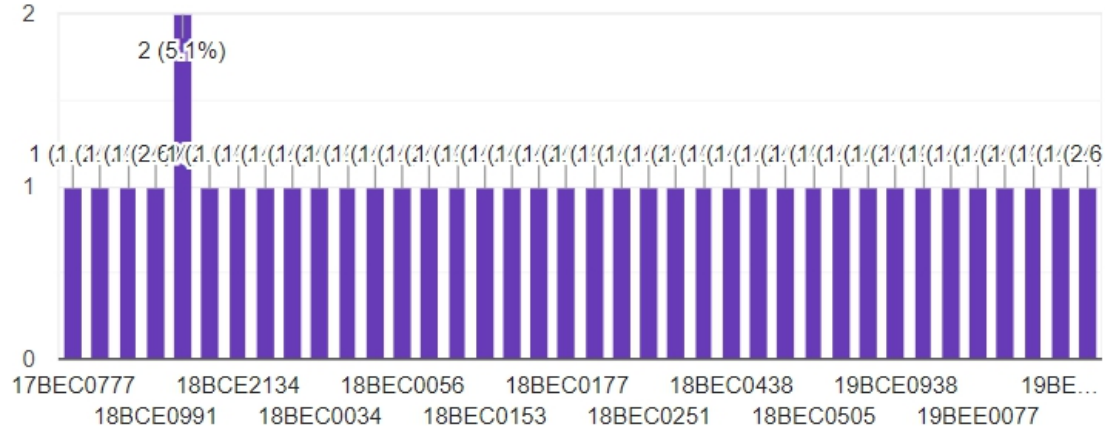
Name

39 responses



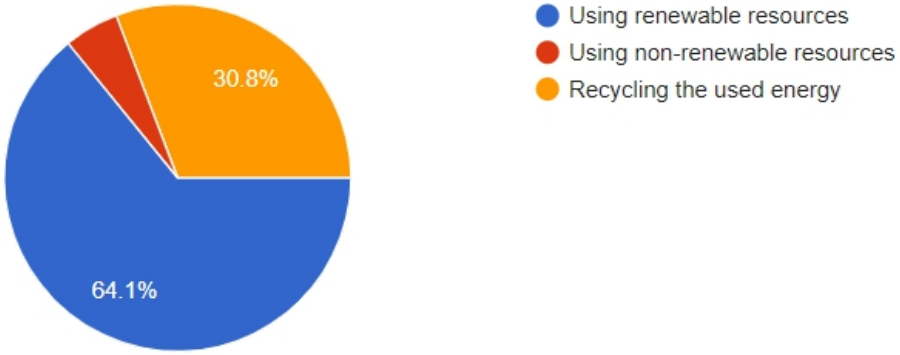
Registration Number

39 responses



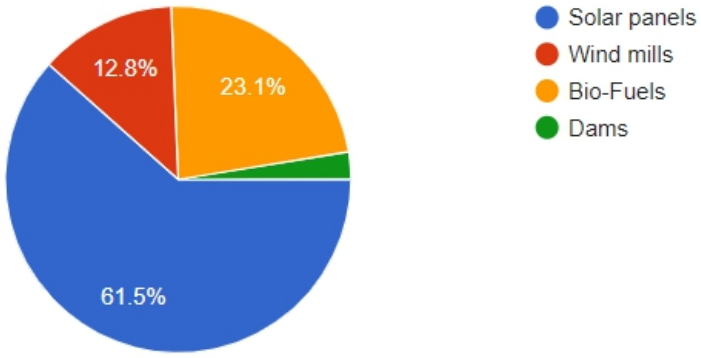
According to you which is the best way to generate clean energy?

39 responses



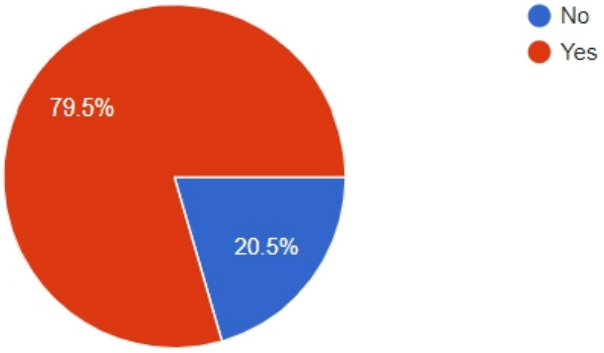
which renewable resources produces clean energy?

39 responses



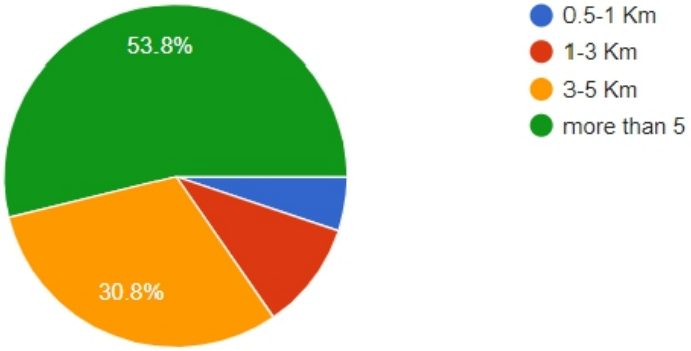
Do you have any idea about Piezoelectric's?

39 responses



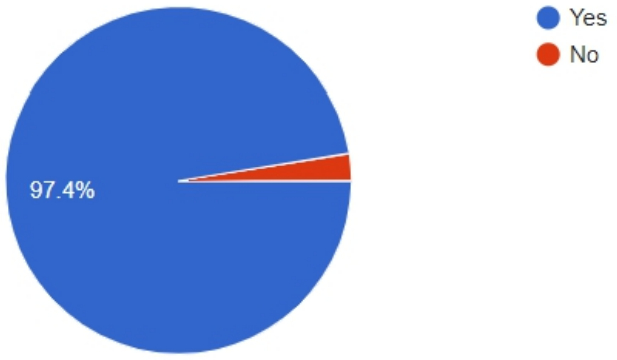
(If No, these material have ability to generate internal charge on application of mechanical stress) On and average how many kilometres do you walk in the campus?

39 responses



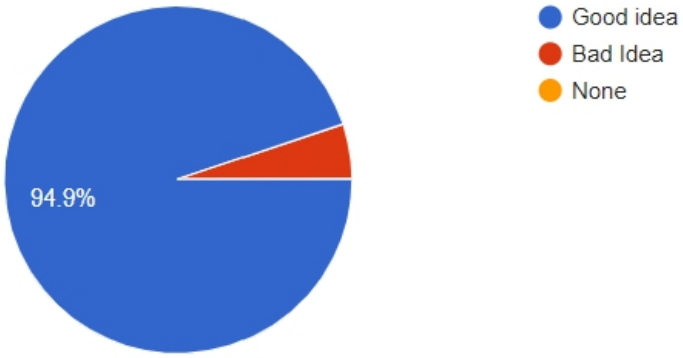
Is it a good idea to convert our energy which we walk to some useful energy?

39 responses



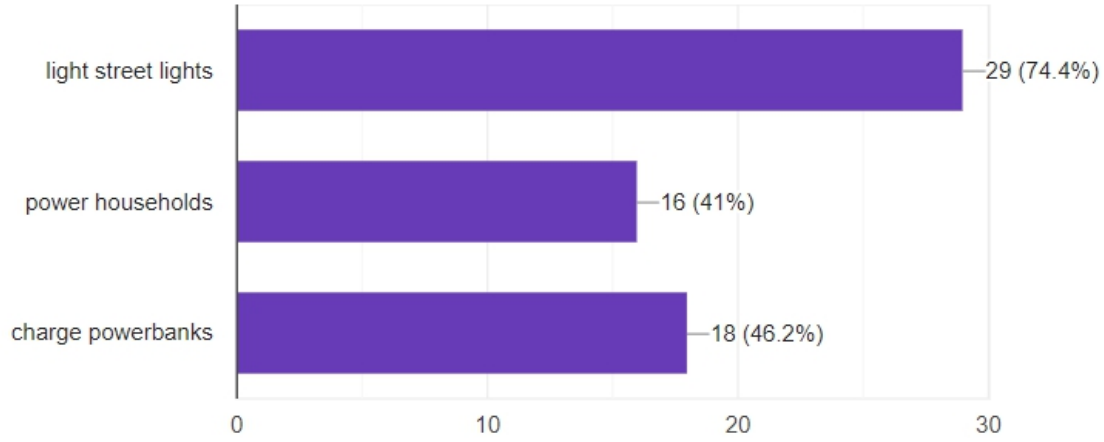
what if we lay a mat of piezoelectric material along footpath in our campus?

39 responses



Where this generated energy can be used?

39 responses



Is this idea of using piezoelectric materials practical or not?

39 responses