



# Final Project Report ED-II



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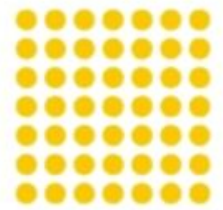
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# Introduction

## Objective

To create a piezoelectric power generator from scratch.

## Background

When mechanical stress or strain is applied to certain materials, a phenomenon known as piezoelectric phenomena occurs where an electric charge is produced. Due to this special characteristic, piezoelectric materials are very beneficial for a wide range of applications, such as sensors, actuators, and energy-harvesting devices. This characteristic is specifically used by piezoelectric power generators to transform mechanical energy into electrical energy.



## Project Summary

Day by day, the population of the country increases and the requirement of the power is also increases. At the same time, the wastage of energy also increases in many ways.

So reforming this energy back to usable form is a major concern. As technology is developed and the use of gadgets, electronic devices also increased. Power generation using conservative methods becoming deficient.

There is a need arises for a different power generation method. At the same time, the energy is wasted due to human locomotion. To overcome this problem, the energy wastage is converted to usable form using the piezoelectric sensor.

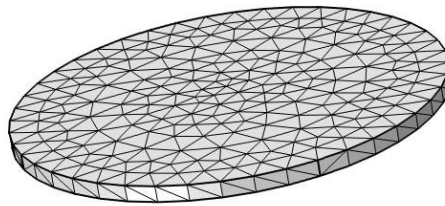
This sensor converts the pressure on it to a voltage. By using this energy saving method, foot step power generation system we are generating power. A piezoelectric sensor is a device that uses the piezoelectric effect, to measure changes in pressure, acceleration, temperature, strain, or force by converting them to an electrical charge.

# Personal Contribution

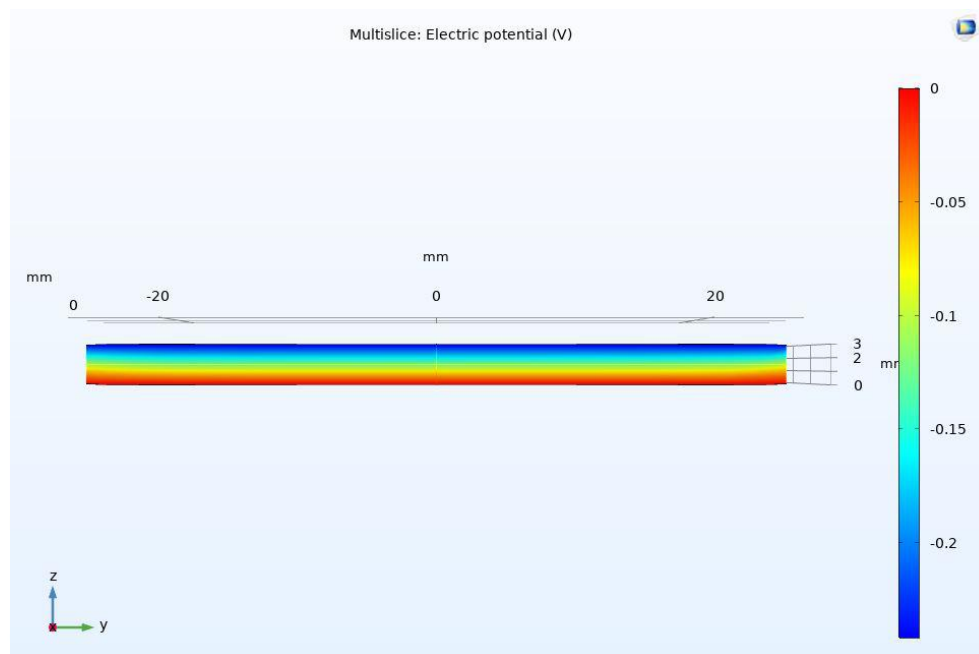
- Significant contributions to the project were made by me by providing in-depth research about various type of piezoelectric material available, their advantages and disadvantages.
- I conducted a thorough simulation on reverse piezoelectric effect and direct piezoelectric effect which governs the working pzt-4 based piezoelectric transducers.
- This information helped shape our circuit diagram. Furthermore, I contributed to the overall assembling of the project.

# Personal Contribution

## Direct Piezoelectric Effect



Mesh Analysis of transducer  
( Radius 27mm, Height 3mm)

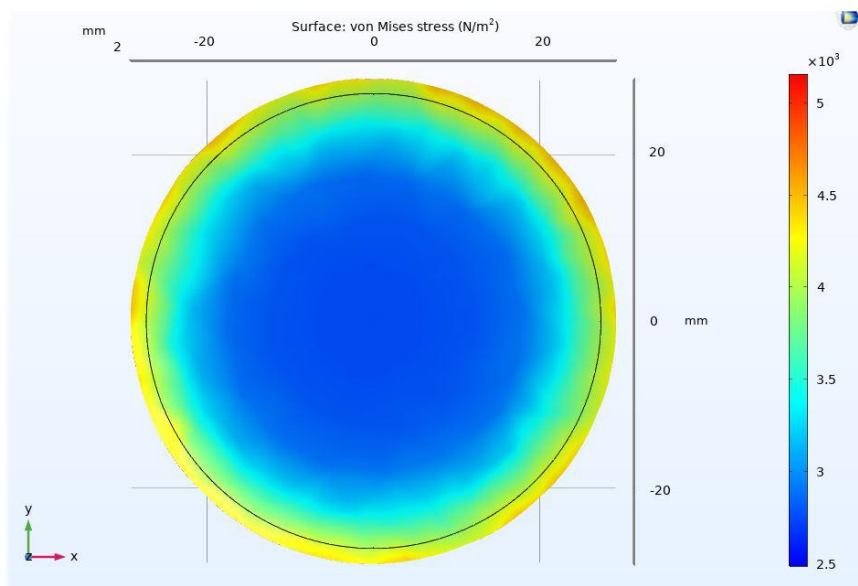


Potential Gradient across the height of the  
transducer for an impulsive force of 10N

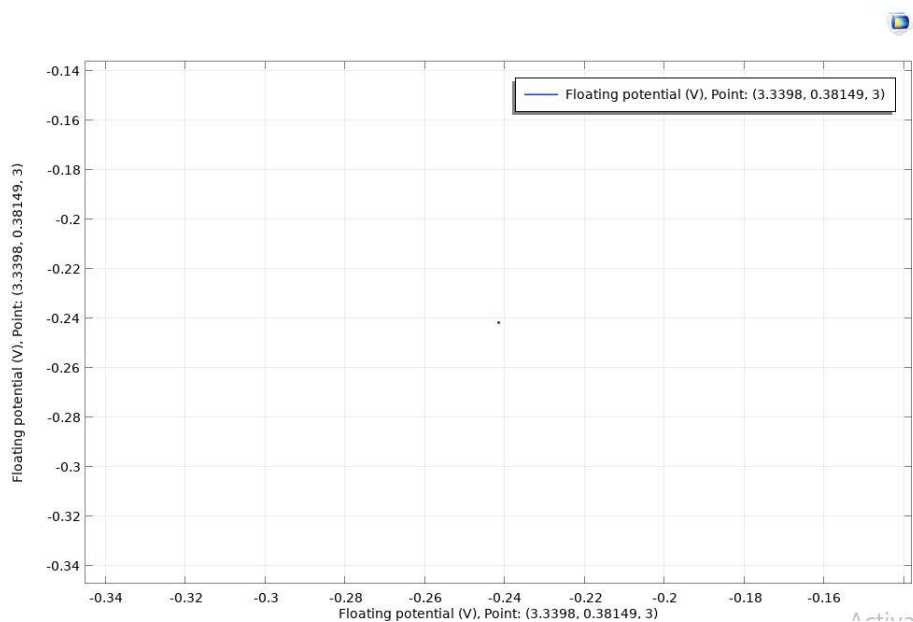


# Personal Contribution

## Direct Piezoelectric Effect



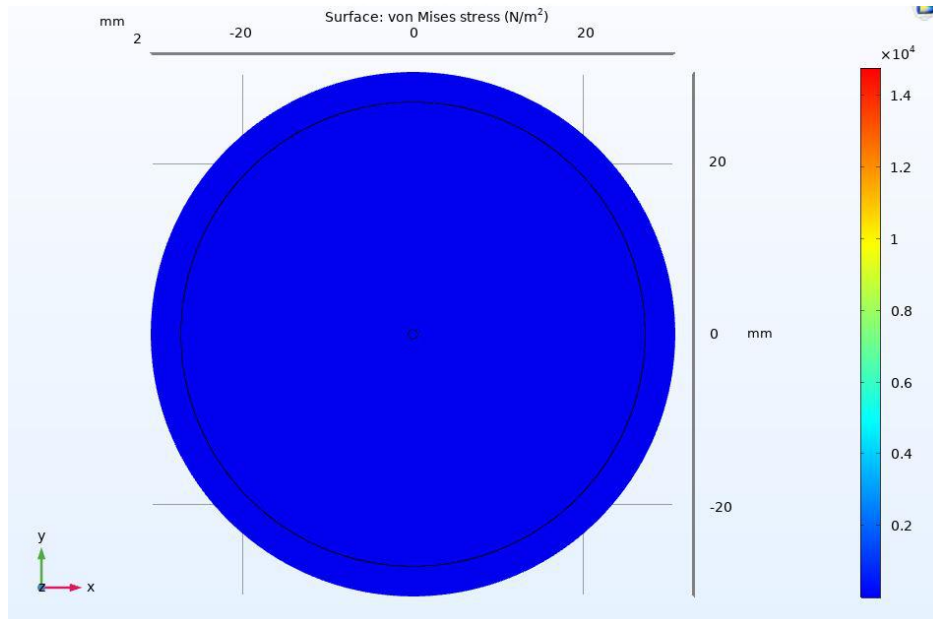
Stress and deformations observed through x-y plane



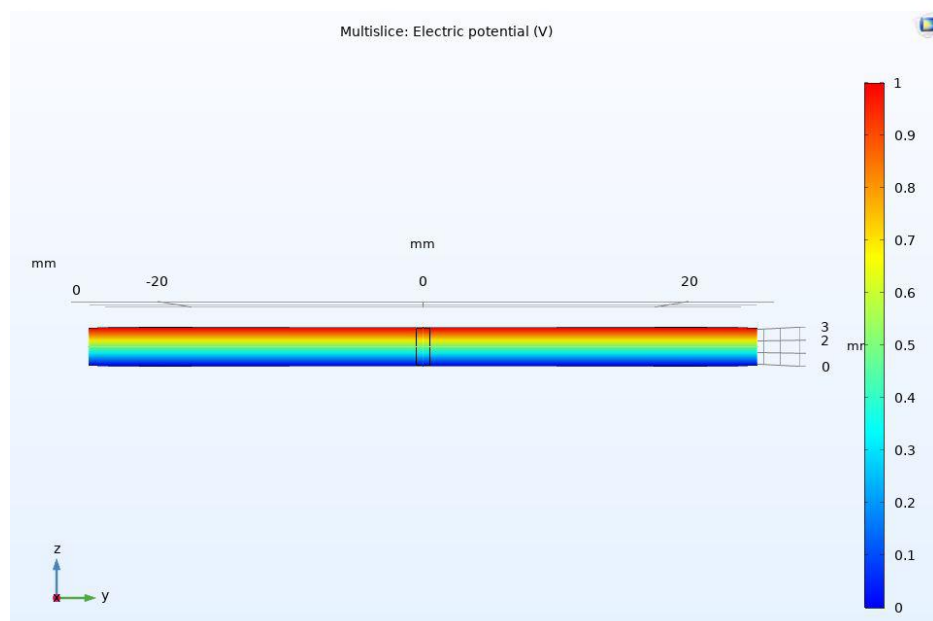
Potential developed for 10 N force

# Personal Contribution

## Converse Piezoelectric Effect



Deformation on application of 1V potential

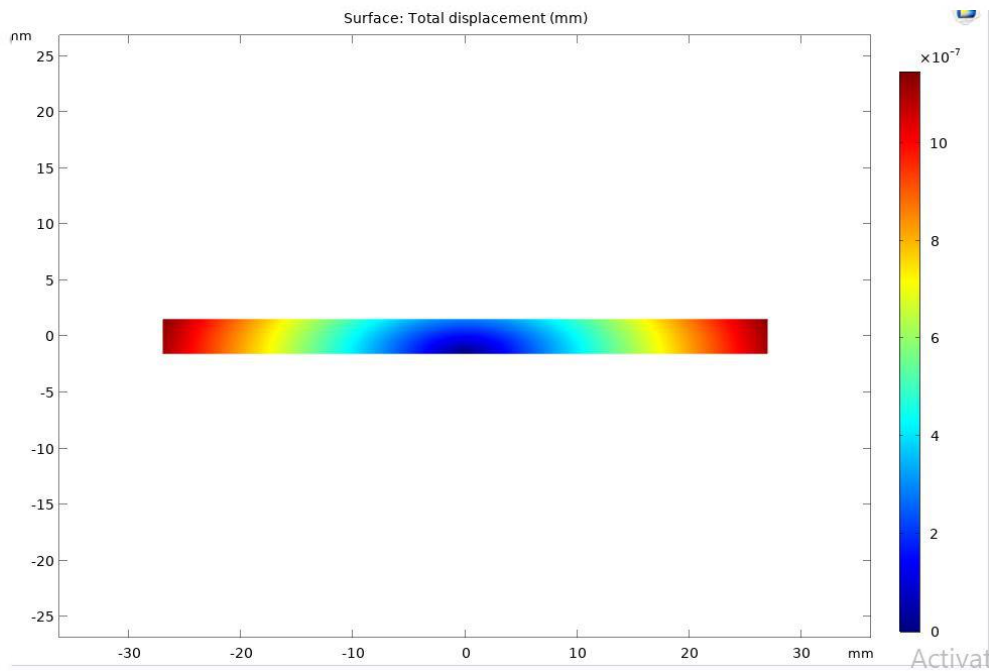


Potential gradient across the height

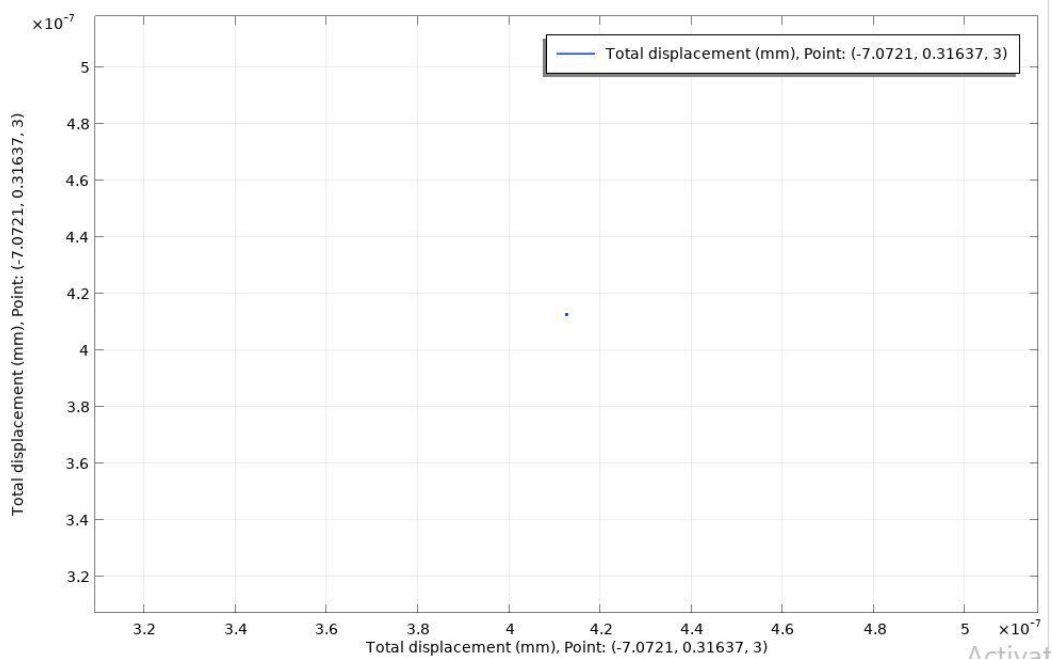


# Personal Contribution

## Converse Piezoelectric Effect



Displacement plot of a point across the cross section



Displacement of a point at the surface at a distance  $R/2$  from the centre



## Conclusion

It has been a long and intriguing journey for all of us, to sum it up. We have been working on the final report since we first chose the subject.

We experienced both good and bad times, as we were unable to complete this job with the efficiency we had hoped.

On the other hand, this project has taught me a lot of things. Although we weren't able to generate enough electricity to charge a phone, we do have the information and experience to help anyone who want to work on a similar project.

