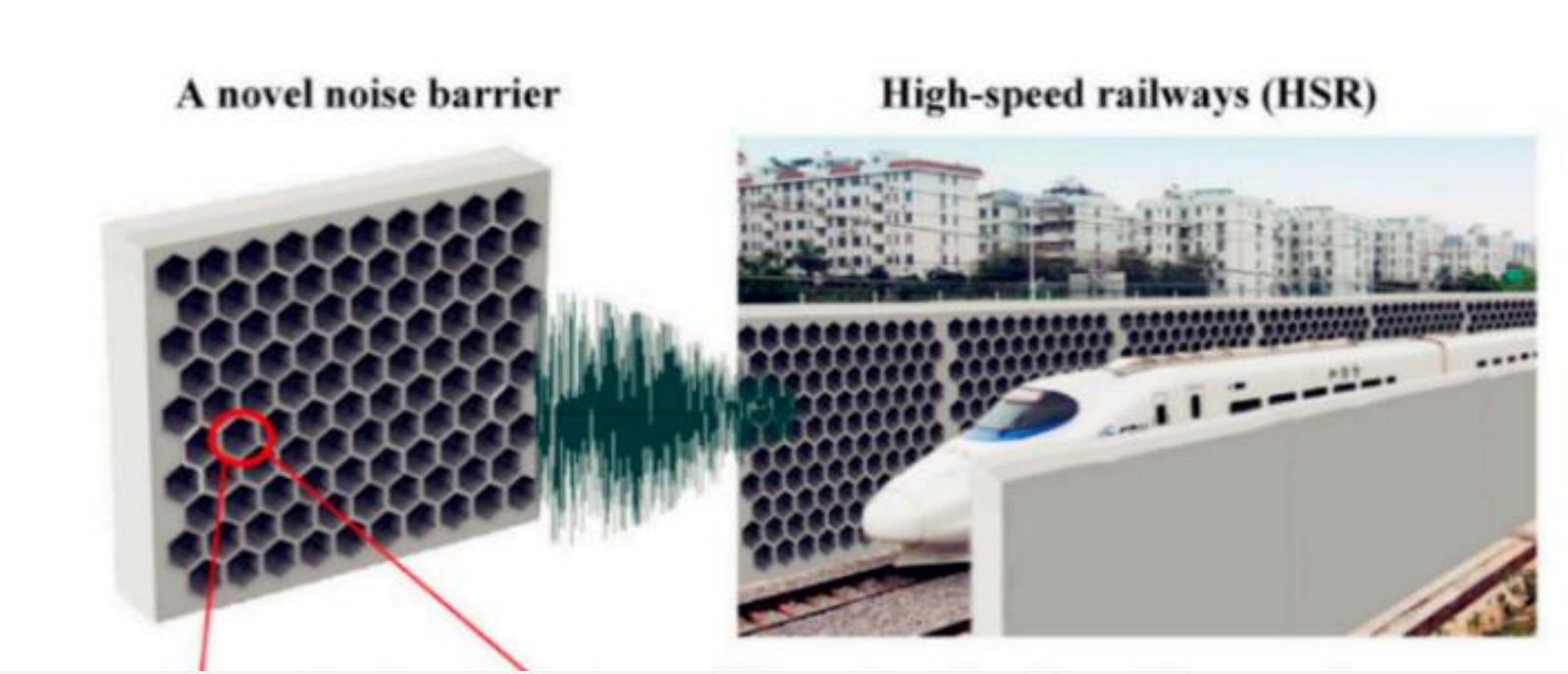
ID1050 CONCEPTS IN ENGINEERING DESIGN

Roadside Acoustic energy harvester - CIP202219

The target is to convert sound energy into electrical energy rather than dissipate it..!!

“PROBLEM STATEMENT”

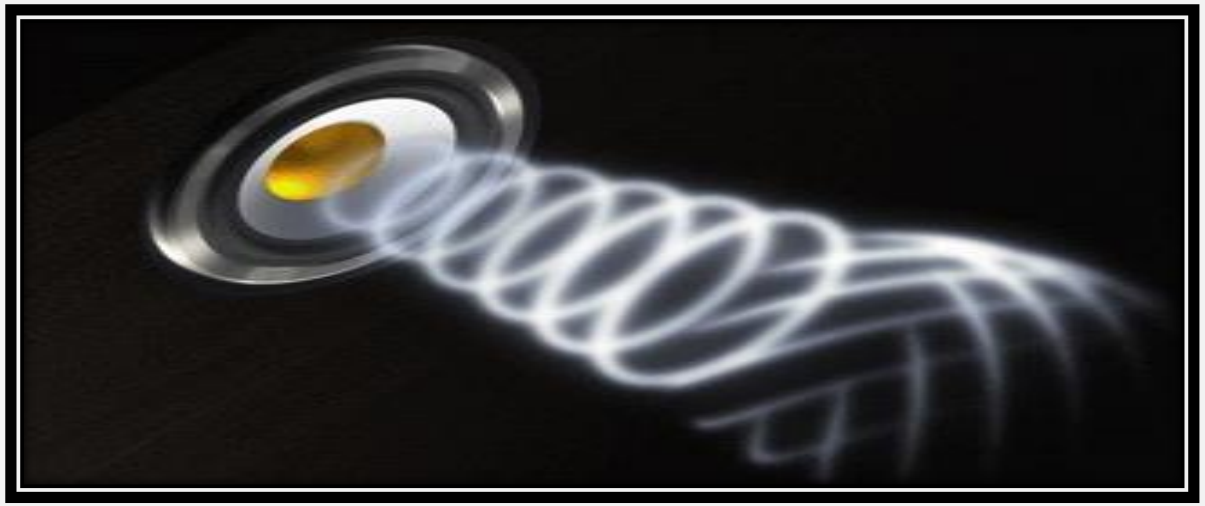
“Using sound energy which is undesired (noise) , to convert into electricity .
Using piezo electric plate (membrane). With the help of Helmholtz resonator , piezo plate is vibrating and hence AC is produced”



Acoustic Energy

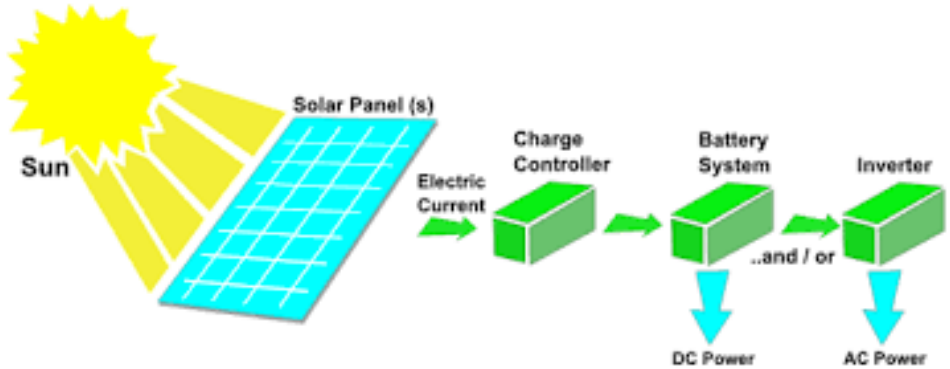
- *Acoustic Energy is defined as the energy that is related to mechanical vibrations from its constituents.*
- *Acoustic sound waves are mechanical waves that possess energy and can be generated by many noise sources.*

What is called as NOISE ?



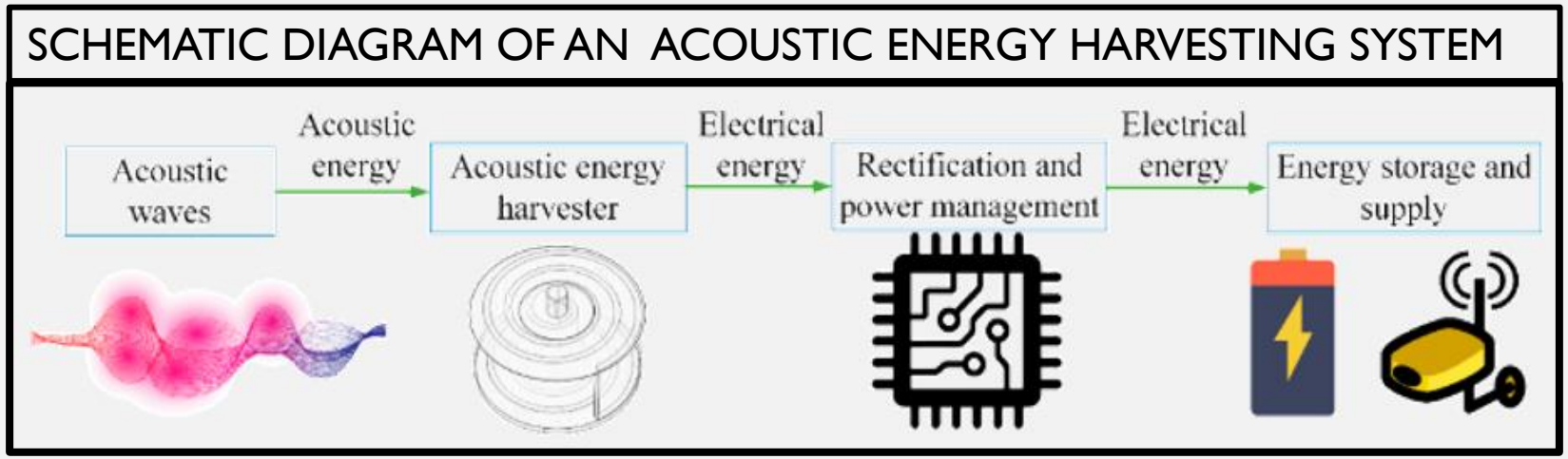
Different Kinds Of Energy Harvesters

The most widely used energy harvesting devices rely on **solar, thermal, wind , and piezoelectric sources of energy**.



Sound waves have the low energy density, Resonators are generally used in sound energy harvesters to amplify the incident sound pressure because of its low energy density.

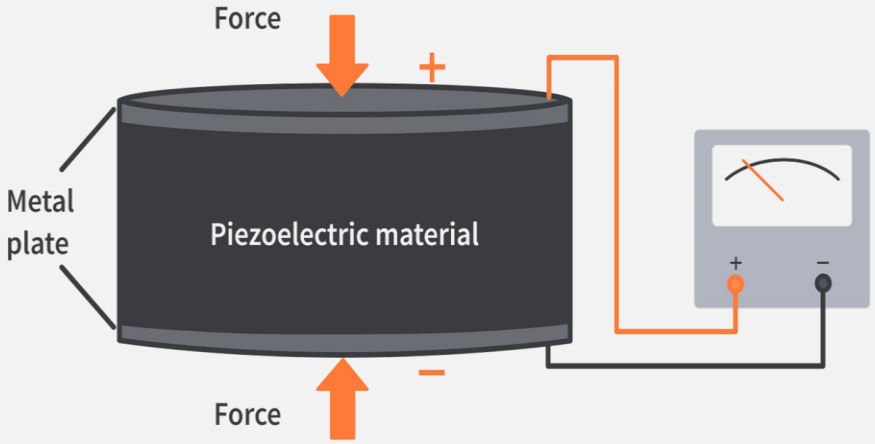
Circuit and components required



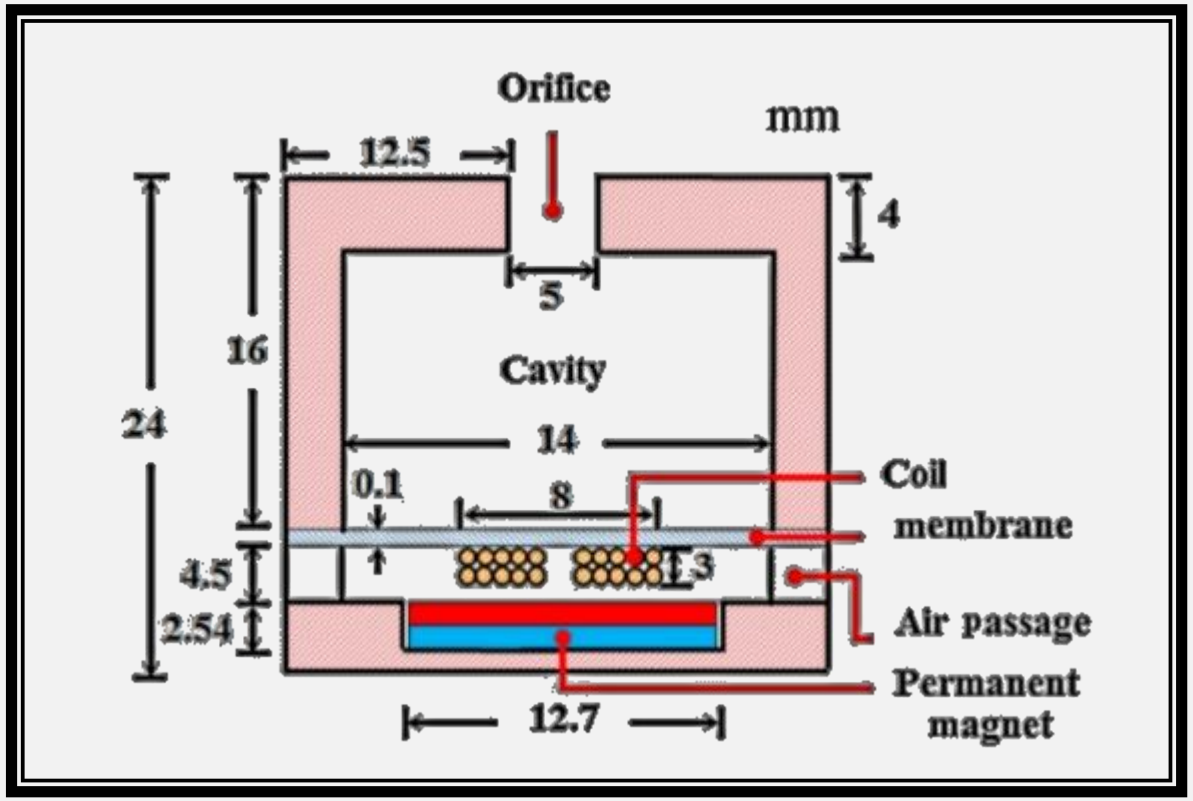
Piezo electric material
Multimeter
Connecting wires
Speaker
3 D printing (PLA material)

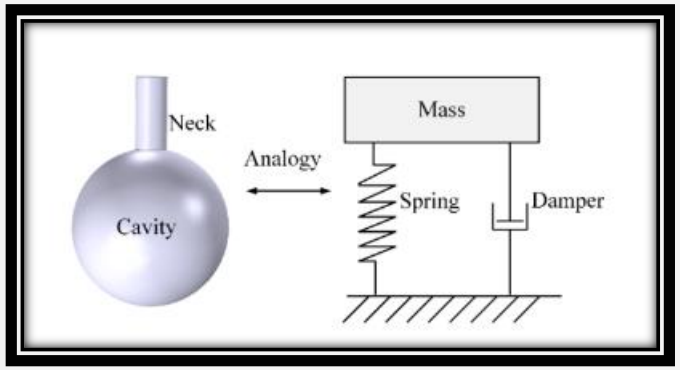
PIEZO ELECTRIC MATERIAL :

Piezoelectric materials are widely referred to as “smart” materials because they can transduce mechanical pressure acting on them to electrical signals and vice versa. They are extensively utilized in harvesting mechanical energy
from vibrations, human motion, mechanical loads, etc., and converting them
into electrical energy for low power devices.



Harvesting cell

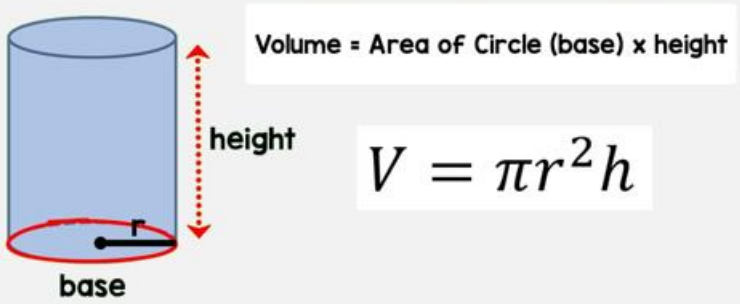




$$f_r = \frac{c_0}{2\pi}\sqrt{\frac{S}{V(L+1.7r)}}$$

End correction factor

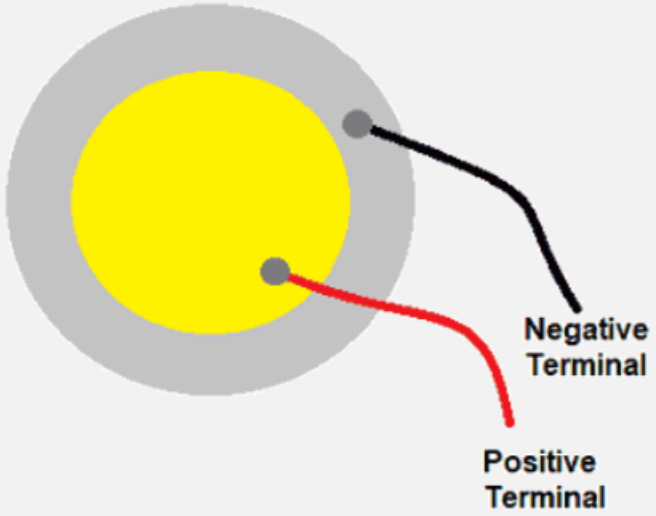
Co = speed of sound
S = surface area of neck
r = radius of the neck
L = Length of the neck
V = volume of the cylinder



Here the cylinder is Helmholtz resonator.

Piezo electric plate used.

After Soldering

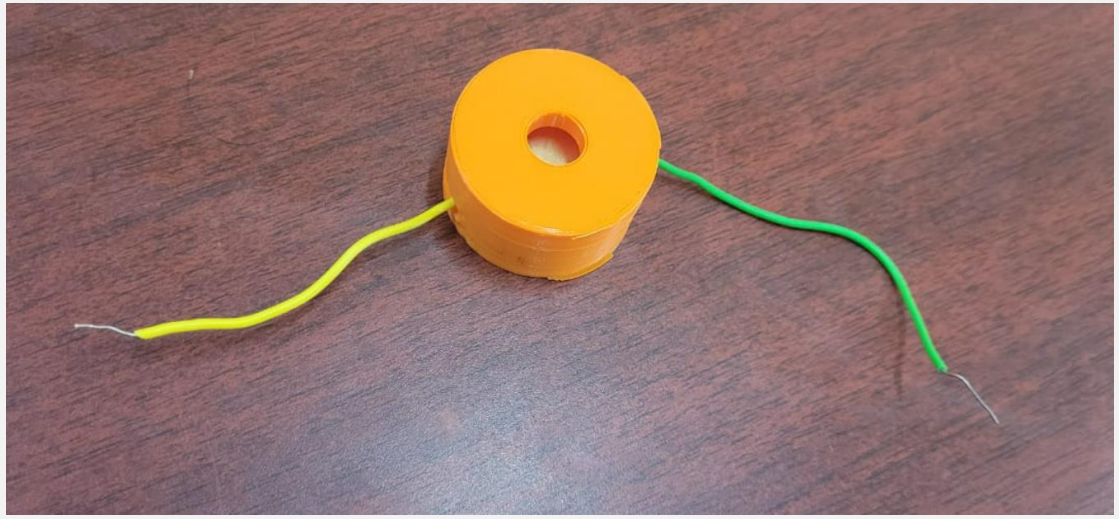


DESIGN BUILDING

Taking temperature in Palakkad as 27C.
We take
Height of the cavity =5.354194mm
Radius of cavity as 5mm.
Length of neck as 5mm.

$$f_r = \frac{c_0}{2\pi}\sqrt{\frac{S}{V(L+1.7r)}}$$

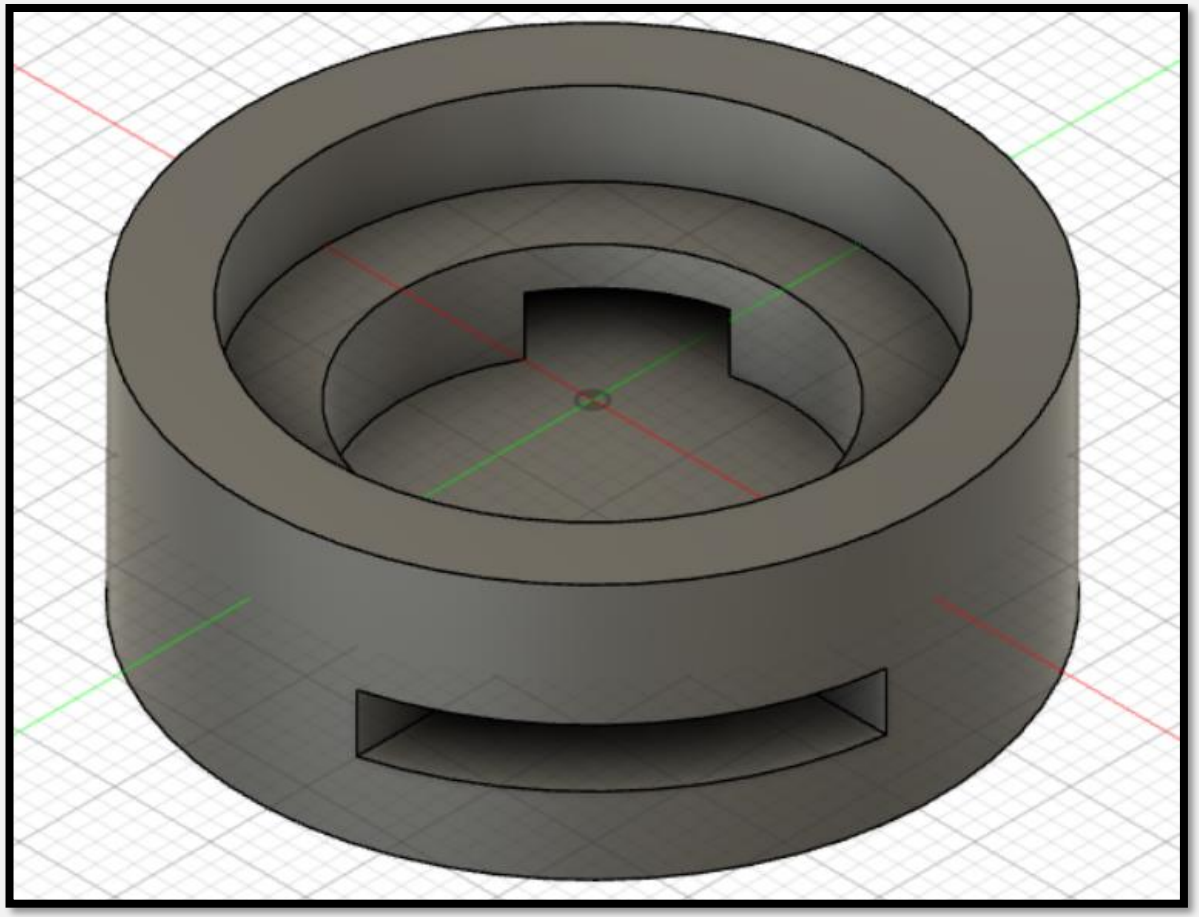
We get the frequency of F = 3250 Hz



Yellow = negative
Green = positive

AUTO CAD FUSION 360 MODELS FOR FREQUENCY 3250 HZ

Base Part



Upper part