

# The Use of Sound Energy In Traffic and Security Lights

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## Abstract:

Due to an increasingly need of transportation for different human, social and economic activities has lead to a daily increase in the number of vehicles especially in developing countries like Tanzania and hence increasing road accidents, despite of the significant role of the traffic and road security lights in preventing these accidents there are some areas that does not have these lights.

Our project aims at preventing road accidents through utilizing noises from moving vehicles to produce electricity for lighting these lights, but how can one produce power from moving vehicles, simply this is through mechanical attraction of the sound waves from vehicles by using a metal plate which will set the metal into oscillation that will deform the piezo plate attached on it hence producing electricity that will be rectified and amplified to produce power for lighting, the traffic and road security lights .



## Method:

Materials used in project are aluminium sheet, stainless steel, nylon 6/6, piezo electric plate, full wave rectifier, resistors, capacitors, diodes, multimeter, soltape, mosfet transistor and a center tap transformer, the complete circuit of the project was divided into two sections the oscillation circuit that generates electricity from sound by mechanical attraction and piezo electric effect and the inverting circuit that amplifies the power for lighting the traffic and security lights.

**Step1;** construction of the oscillators.

### Procedures

- The aluminium, stainless steel and the nylon were used to construct three oscillators simultaneously.
- then piezo electric woofers were then bonded on the oscillators with glue and then soldered with wires.
- a full bridge rectifier was connected to change A.C to D.C and then connected to the resistor and capacitor.
- Experiments were done to determine the best oscillators and the quantity of the output voltage given from the oscillators.

**Step2;** construction of the inverter

### Procedures

- the output from the oscillators was then connected into a transistor (mosfet), the center tap transformer, rectifier and a capacitor to amplify the voltage.
- the device was tested several times and then sent into a busy road(field) to determine its efficiency compared to the laboratory experiments and also to determine the other factors affecting the device apart from sound.

## Results:

**Results from step1;** both oscillators were experimented through flicking the oscillators and through bringing them near a sound producing devices like subwoofer to see how much voltage they produce

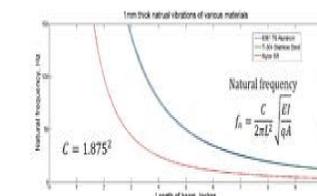
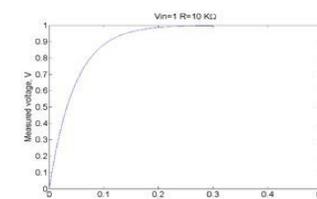
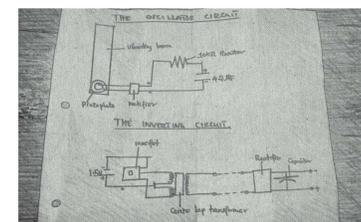
-the aluminum oscillator was seen to work best followed by the stainless steel and lastly the nylon oscillator as shown on the graph 01.

The time taken by the oscillators to charge the capacitor and the output voltage from it was measured, recorded as per graph02 and the time curve was seem to remain the same no matter how much the input voltage is. **GRAPH02**

**Results from stape2;** when the oscillators was flicked produced a smaller voltage compared to when the oscillator was brought near a sound producing device (subwoofer)

-the voltage produced from the inverting circuit was able to light up a bulb.

-when the device setup was taken to a busy road for field tests the efficient was seen to change highly and a number of observations like the wind, natural earths vibrations and air pressure were seem to increase the efficiency of the device in producing a higher voltage since they tend to increase the number of oscillations per second.



## Conclusions:

From the results from step1 we see aluminum and steel to have higher efficiency compared to the nylon since they have higher young modulus than the nylon, from the graph2 shows that the output voltage and the input voltage can be easily calculated as per  $V=V_i(1-e^{-t/T})$  where T is the time constant given by  $T=C.R$

-From the results in step 2 we can conclude that production of electricity does not only depend on sound but also wind, natural vibrations, pressure and many other factors that are able to produce necessary stress on the piezo plates through oscillation of the metal plate.