

## Conversion of Noise Pollution Into Electrical Energy

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**Abstract** —Life is intricately woven with many necessities. Electrical energy is no less than the life source itself, hence, tops the list source of priorities. In the search for alternative energy sources there's one form of energy you don't hear much about, which is ironic because Sound a source which engulfs every phase of life and environment always goes waste once produced which is a renewable source of energy. Sound is a mechanical form of energy which travel in the form of wave, mechanical wave that is an oscillation of pressure this pressure created by the sound could be used to convert it into electric energy or other form of energy.

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**Keywords** - Alternative energy, transducer, noise, power.

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### I. INTRODUCTION

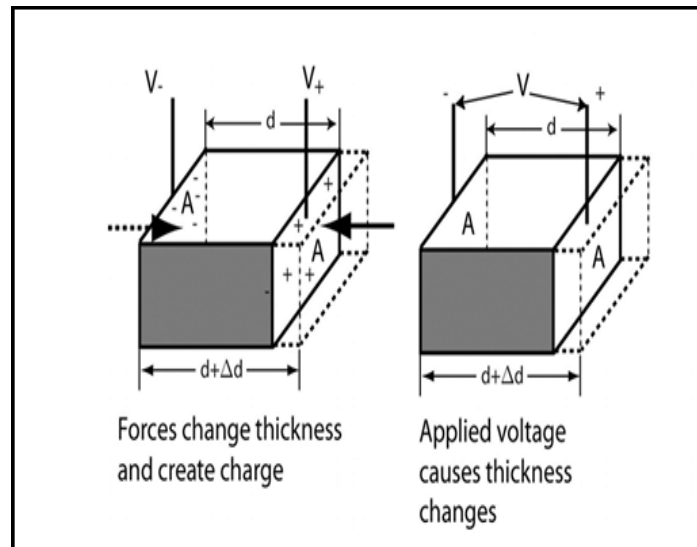
The law of conservation of energy states that energy cannot be created nor be destroyed. Under the consideration of this law the technological giants have discovered numerous sources to extract energy from them and use it as a source of power for conventional use. Sound or popularly known to us as noise is one of the widely available energy sources which have its range extending almost to infinity. The noise is considered to be a great contributor in the increasing pollution which is studied under the category of noise pollution. Sound basically is mechanical wave that is an oscillation of pressure transmitted through some medium (like air or water), com-posed of frequencies which are within the range of hearing. Thus, considering sound as the wave we can imagine it as the flow of energy from one point to another with the help of a medium as air. The sound waves can be longitudinal as well as transverse as per direction of vibration of the sound particles called phonons.[1]Application of sound energy as the source of electricity can be much beneficial for the human existence as compared to other sources. This is because the sound is present in the environment as a noise which forms an essential part of the environmental pollution. The concentration of noise to use it for power generation can lead to discovery of another hidden source of energy which can act as a boon to non-renewable sources such as coal, crude oil etc. which are on line of extinction. Piezoelectrics are materials capable of turning mechanical energy into electricity, and it is as simple as cane sugar, bones, or quartz. Piezoelectrics create an electrical charge under stress. Noise of about 100 decibels can produce an electrical current of about 50 millivolts. Piezo material converts mechanical strain into electric energy this property of piezo material could be used to make a device which would be able to sustainably convert the sound energy to electric energy. [6]

### II. SOUND ENERGY

Sound or popularly known to us as noise is one of the widely available energy sources which have its range extending almost to infinity. The noise is considered to be a great contributor in the air pollution. [1]Sound basically is mechanical wave that is an oscillation of pressure transmitted through some medium (like air or water), composed of frequencies which are within the range of hearing. Thus, considering sound as the wave we can imagine it as the flow of energy from one point to another with the help of a medium as air. The sound waves can be longitudinal as well as transverse as per direction of vibration of the sound particles called phonons. Sound that is perceptible by humans has frequencies from about 20 Hz to 20,000 Hz. In air at standard temperature and pressure, the corresponding wavelengths of sound waves range from 17 m to 17 mm.[3]

### III. PIEZO ELECTRIC MATERIAL

In physics, the piezoelectric materials can be described as the link between electrostatics and mechanics. voltage in solids. It is reversible, an applied mechanical stress will generate a voltage and an applied voltage will change the shape of the solid by a small amount (up to a 4% change in volume). [7]



**Figure 1 Piezoelectric Material**

Piezoelectric materials exhibit intrinsic (spontaneous) polarization. Most of the piezoelectric materials are ceramic in nature, barium titanate for example, but there are some polymeric materials that are used for specialist applications. Piezoelectric ceramics are usually polycrystalline materials that are divided up into regions of similar polarization (domains).[9] Once aligned, these domains produce a net polarization. If an electric field is applied, the dipoles within the domains either contract or expand (resulting in a change in the volume). If a strain is applied, the dipoles are again forced to contract or expand, this time producing a potential difference.[7]

#### IV. CONVERSION BY MAGNETIC FIELD

In this method create a very thin curtain like diaphragm which will get fluctuated by the oscillation and pressure created by the sound wave and a conductor will be attached to it which will be placed between magnetic bars these fluctuation in the curtain will create a movement in conductor which will affect the magnetic field of the magnet this will generate motional emf and will generate voltage across it. Thus the oscillation created by the noise wave could be converted into electricity and as the frequency is high the movement will be fast due to it we will get appreciable amount of electric energy.[4]

#### V. CONVERSION THROUGH HEAT ENERGY

In this method convert sound energy to heat energy as sound travel by oscillating the particles of the medium so when sound energy travel through the medium it will disturb the particle of the medium these disturbance created by sound will be used to convert it into heat energy as when the particles of the medium will be pushed by the sound wave it will collide with adjacent particle of the medium this collision will result in production of heat energy the production of heat energy will be more in the denser medium so for more heat production will need a material with very high density. This heat energy will be converted into electricity.[4]

#### VI. CONVERSION BY PIEZOELECTRIC MATERIAL

Converting sound energy to electricity by piezo electric material device could be made which will collect the sound wave that are travelling near it and that sound wave will be used to cause a strain due to pressure created by its oscillation in the piezo crystal and that will create the disturbance in its atoms resulting in the flow of electric charge on the surface of the crystal thus sound energy could be converted into electricity as the piezo electric material convert mechanical strain to electric energy. And thus this sound energy could be used to perform various tasks by converting it into useful electric energy.[4]

#### VII. ADVANTAGES

- Due to conversion from the sound to the electric energy it is possible to use energy in abundant.
- It helps in the reduction of CO<sub>2</sub> at vast scale.
- The electric energy is the cleanest energy.
- With an effective conversion we can use this energy to lighten the street lights and can use effective signal marks of lights sensors that can prevent accidents.
- The noise pollution in runway could be used to produce electricity in many other ways also.
- In civil engineering, the noise from cars can be which leads to electrical energy production.
- Moscow like places can become such places leads to efficient amount of electrical energy production.
- This method is very effective and therefore the scope of this smart approach never ends.

#### VIII. DISADVANTAGES

- Its efficiency is not so good so improvement is being required.
- It could not give its result if used in the places where decibel of sound is very low.

- It is entirely based on sound of critical value.
- Installation of the entire device is bit costlier.
- Its initial cost is high number.

#### **IX. FUTURE SCOPE**

In near future if we are able to use this kind of energy then it will cause revolution in the field of the renewable sources of energy. Due to development of new sources like sound we can overcome the deficiency of electricity that we are facing in the developing countries across the world.

With the advancement of this technology we can also imagine the charging of various battery operated devices such as our mobile phones just by making a call to a friend and talking. The mobile devices will literally satisfy their name as they will be-come quiet portable without much concern about their battery life.

Its other application field includes the lightening of the street lamps and traffic lights just by extracting the sound energy of the noise that is produced by the vehicles on the road. In this way we are not only able to reduce the noise pollution and but also utilize it as a source of electricity.

Also in the industries with the mechanical forte where very huge amount of the noise is produced as result of functioning of heavy machineries this sound can be trapped and can be used to run the low power machines used in production process.

#### **X. CONCLUSIONS**

The sound energy is the unexplored source which has enormous potential to meet the future growing requirements of the electricity and serve as the eco-friendly and renewable source of energy. This technology is not practically usable up till now due to efficiency concerns but the present work on this field makes its future quiet promising. Phonons are the particles of sound that provide the mechanical energy as the output which could be utilized for conversion as per the laws of thermodynamics.

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