

Generation of Electricity from Industrial Noise

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Abstract - this paper explores a relatively less popular source of clean energy. Noise (sound) energy can be converted into viable source of electric power by using a suitable transducer. This can be done by using a transducer by converting vibrations caused by noise into electrical energy. An application is proposed for the same, in which a speaker and a transformer are used to convert noise produced by industrial machines into electrical energy. The vibrations created by noise can be converted into electrical energy through the principle of electromagnetic induction. The received signal was stepped up using a transformer. A similar setup was placed at distance of 1 meter from the working generator or a induction motors. The demonstrated ideas probe into a clean and readily available source of energy.

Key Words: Sound Energy, Electrical energy, Industrial Noise, Diaphragm, electromotive force.

1. INTRODUCTION

The need for an alternative source of energy is rising fast. Until now, majority of power needs of the world relies upon the exploitation of the non-renewable fossil fuels. However recent estimates put the use of oil and coal up to 2030, after which the world will need to foster the need for a more efficient and wide spread use of technology. The search for a renewable source of energy that can satisfy our ever growing needs is the need of the hour. Solar & wind energy have already been tapped as a source of renewable source of energy, and are now being widely accepted as one of the replacements for fossil fuels. However their availability and adherence to natural factors such as weather conditions. However a largely ignored and more readily available source of energy is available in the form of sound energy. Sound as an alternative source of energy has a huge potential that has been left largely untapped as we progress further towards using Renewable and sustainable sources of energy. This paper takes a step forward in this direction, using sound as

source of energy to provide a viable electronic source in a vehicle, converting the sound wave s into electrical energy. The creation of energy through sound can thus translate into creation of electrical energy by one of the most readily available form of pollution.

Sound waves are a form of mechanical energy. As per the law of thermodynamics, oscillations of mechanical waves can be converted into electrical energy. We have used the principle of electromagnetic induction, using transducers to convert mechanical into electrical energy.

The proposed technique generates electrical energy through readily available sound energy. This technique not only helps in generating electrical energy from noise but also helps in reducing pollution. Production of electricity from available noise pollution as a source is a relatively new concept. The generation of noise pollution, objectionable though it may be, is mostly unavoidable in most circumstances. Therefore, the production of energy from this available sound source can prove to be useful.

2. METHODS USED

The use of sound to produce electricity is not a new concept. One of the first to achieve this feat was the researchers from LosAlamos National Laboratory in collaboration with the Northrop Grumman Space Technology, USA. They built a compact generator which used the movement of helium gas to generate sound waves that drives a piston to move a coiled Copper wire. However, as the sound in this case was artificially created to generate electricity, it does not transform naturally available or already available sounds and noises present in the environment into electricity. Also the use of a non-renewable source of energy to create a comparatively less efficient energy source is not a feasible output.

Another technique was the use of piezoelectric transducers to convert sound into electrical energy. In this case, the sound generated by various sources was converted into electrical energy and stored in a 9V DC battery. However, the use of piezoelectric material is costly and economically unviable for the purposes of generation.

The technique used was noise filtering, and therefore there were excessive losses as the sound was not completely channelized through the Piezo electric material.

A method which has taps mechanical energy from the vibration of vehicular movement and converted it into electric energy by piezoelectric effect. However, this technique does not foresee all possibilities, including that the piezoelectric material may be destabilized due to overload.

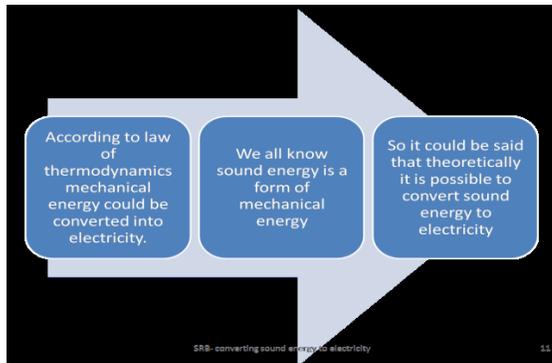


Fig-1: Energy Conversion

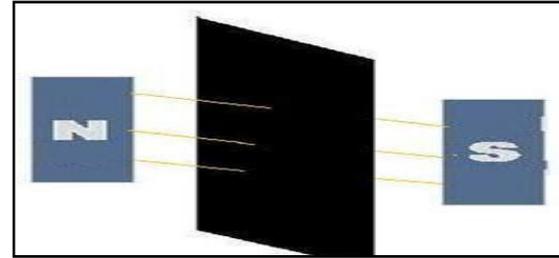


Fig-2: Generation of emf

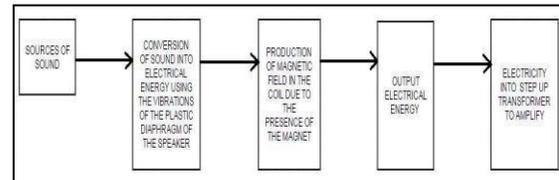


Fig-2: Conversion of Sound Energy into Electrical

4. RESULTS

Table-1: Values of Electrical Energy generated

| S.No | Sound Level(dB) | Voltage(V) |
|------|-----------------|------------|
| 1 | 87 | 0.70 |
| 2 | 88 | 0.90 |
| 3 | 88 | 0.91 |
| 4 | 89 | 1.00 |
| 5 | 90 | 1.20 |
| 6 | 90 | 1.30 |
| 7 | 90 | 1.40 |
| 8 | 90 | 1.50 |
| 9 | 90 | 1.62 |
| 10 | 90 | 1.63 |
| 11 | 103 | 0.50 |
| 12 | 106 | 0.70 |
| 13 | 107 | 0.80 |
| 14 | 107 | 1.09 |
| 15 | 109 | 1.10 |
| 16 | 110 | 1.20 |
| 17 | 112 | 1.60 |
| 18 | 113 | 2.20 |
| 19 | 113 | 2.30 |
| 20 | 114 | 2.70 |

3. PROPOSED METHOD

The proposed technique uses transducers to harness vibrations caused by sound and convert it into electrical energy. The circuit was installed at the source of the noise. In this circuit, sound waves fall on a diaphragm, which is connected to an induction coil placed in front of a permanent magnet. As the sound waves reach the diaphragm, it starts to vibrate. When the diaphragm vibrates, the coil moves along with it. The movement of coil creates a varying magnetic field around it. This varying magnetic field induces a current into the coil. As per Faradays law of Electromagnetic Induction, a varying magnetic field produces electromotive force(emf) across a conductor, if the conductor circuit is in a closed loop then an induced current will also circulate through it.

The voltage drop across the coil is measured using a digital multimeter in volts (V). The sound is measured through a sound level meter in decibels (dB). This voltage produced across the coil was stepped up using a transformer.

Thus according to Faradays law, the generated electromotive force (emf) depends on velocity of relative motion between coil and the magnet, strength of magnetic field and length of conductor. In order to convert the maximum available sound energy coming through the car horn and the silencer, the sound was passed through a channel made up of a sound insulating material.

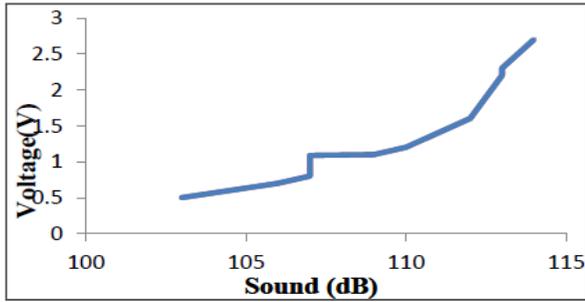


Chart-1: Electricity Generation with Sound Energy

5. CONCLUSION

There are multiple sources of sound which go unnoticed, one of them is the noise generated by industries. The use of transducers to convert sound waves (noise pollution) into energy demonstrates that noise can act as an alternative source of energy. It is noted that the values from the motorcycle can be further enhanced as they were taken after the muffling effect of the exhaust pipe. This method further gives way to a here to fore largely unexplored source of clean energy. The results show that as the noise level increases, the corresponding voltage that was measured at the multimeter also increased. The results further show that there is a non-linear relation between sound energy and the developed voltage.

This relationship can be furthered using higher quality equipment. This shows that through a sustainable amount of time, the methods adopted can be used to create sufficient electrical energy that can be successfully stored in a DC battery.

6. FUTURE SCOPE OF WORK

This device can be installed in areas where large amount of noise or sound energy is generated like in nuclear power plants, heavy machinery, as this device will not only generate green energy but also help in reducing noise pollution levels.

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BIOGRAPHIES



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