

POWER GENERATION USING NOISE POLLUTION

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Abstract – *Electricity is one of the most important blessing that science has given to the mankind. It has also become a part of modern life and one cannot think of a world without it. The use of electricity is increasing day by day while the resources needs for production are limited and reducing drastically. It became necessary to find an alternate sources for production of electricity.*

In this project we are trying to research and implement one the solution that is noise pollution. Noise is defined as unwanted sound but sound consists of vibrations and pressure. Vibrations refers the oscillating movement.

Our methodology is based on the oscillations created by the sound wave which can be further converted to electricity by the use of magnetic field. We will use loudspeaker as a transducer to work opposite as its normal working, instead of converting electrical signal into sound it converts sound wave into electrical energy.

Key Words: noise pollution, vibrations, oscillations, magnetic field, transducer, electric signal.

1. INTRODUCTION

Electricity plays important role in our life there is a greater need of electricity, without electricity many of our work will shut down and stuck. The amount of electric consumption is also increasing day by day as we need electricity in every sectors hence this increased consumptions results in the high use of non-conventional resources for production of electricity, thus requires the alternate source of energy is to be found. There are various eco-friendly sources of energy that we have discovered till the present era. New and creative methods are used for production such as foot step generations, solar, wind as well as thermo-electric generators are being produced. To add to the list is an emerging scenario which leads us to a new renewable energy source know to us since long and that is the sound or noise in other terms is present all around us.

Noise is the form of pollution which is not restricted till industries only, sources of noise includes vehicles, loud music in marriage/celebrations, airports and railway tracks etc. The noise consist of vibrations, these vibrations refers to the oscillating movement of any object. These oscillations can be converted into electrical energy.

Sound energy is converted into electrical signals using diaphragm present in the microphone and these signals then

reach to the speakers and then converted back to sound. The electrical current generated by a micro-phone is very small and referred to as MIC-level; this signal is typically measured in mill volts. Before it can be used for any-thing serious the signal needs to be amplified, usually to line level (typically 0.5 -2V). 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.

Sound energy is a mechanical energy which travel in the form of wave, mechanical wave that is an oscillation of pressure which need medium to travel i.e. it could not travel through vacuum. In medium like liquid and gas sound is transmitted as longitudinal wave whereas through solid it could be transmitted as both longitudinal wave and transverse. When sound wave travel through a medium in that medium is periodically displaced and thus oscillates with sound wave. The sound wave displace back and forth because of the potential energy compression and the kinetic energy of the oscillation.

Different methods for conversion sound to electrical energy are:

1. By means of Piezoelectric Device
2. Diaphragm Coil Mechanism (Speaker Transducer)

1.1 By means of Piezoelectric Device

The term piezoelectricity define as electric charges that accumulates in certain solid materials in response to applied mechanical stress. The Piezoelectric effect is the liner electromechanical interaction between the mechanical and the electrical state in crystalline materials with no inversion symmetry. Piezoelectric materials are the crystal which converts mechanical strain to electric energy. Piezoelectric materials are transducers its crystals could convert mechanical strain to electricity, the crystals are formed naturally e.g. quartz etc. The sound energy could be converted into electricity using piezoelectric material. Piezo electric materials are transducers its crystals could convert mechanical strain to electricity Converting sound energy to electricity by piezoelectric 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. Hence sound energy could

be used to perform various tasks by converting it into useful electric energy.

1.2 Diaphragm Coil Mechanism(Speaker Transducer)

Diaphragm are the coil which converts sound to magnetic flux to electric energy. The strain applied to diaphragm coil by sound energy could be converted into electricity. A loudspeaker (or speaker) is a transducer, which converts an electrical signal into sound waves. Since noise is also a form of sound wave or mixture of different kinds of waves, which gets wasted in the environment, so by law of conservation of energy it can be converted into another form of energy i.e. electrical energy, so by using a speaker in its reverse form we can convert this wasted energy into useful electrical energy. In heavy noisy places (like parties, clubs, railway, metro stations, road traffic areas, movie theatres), we use a speaker to receive the wasted sound waves (noise). These waves will provide mechanical vibration to the diaphragm of the speaker so that the diaphragm starts oscillating, since the coil of copper wire is attached to the diaphragm of the speaker, the coil will start oscillating and then due to back and forth movement of the coil an electric field will be produced due to the magnets placed near the coil, which gives the electrical energy from the outlet point of the speaker.

2. PROBLEM STATEMENT

Electric consumption is increasing drastically, where as conventional sources are limited in nature. Due to this we have to think something innovative. In recent years, the study of electric generation using sound is in the process. On the one hand, with the development of industry and agriculture, energy crisis threatens the world. On the other hand, noise pollution is being paid more and more attention to. Therefore, to convert noise into electricity will kill two birds with one stone.

3. COMPONENTS OF SYSTEM

3.1 Diaphragm Coil

When a diaphragm coil is placed in an electric field, or when charges are applied by external means to its faces, the coil exhibits strain, i.e. the dimensions of the crystal changes. When the direction of the applied electric field is reversed, the direction of the resulting effect of magnetic waves is reversed. This is called the inverse diaphragm electric effect. So it could be seen that when the sound energy is applied to the diaphragm coil it create magnetic wave strain within the coil then it reverse it and the magnetic wave strain is converted into electric energy. This direct coil electric effect property of diaphragm coil could be used for making the device to convert sound energy to electric energy. Diaphragm coil converter a device could be made using diaphragm electric material which will collect the sound wave which are travelling near it and that sound wave will be used to cause a magnetic waves strain due to

magnetisation created by its coil in the diaphragm coil and that will create the magnetisation within the coil resulting in the flow of electric charge on the surface of the crystal thus sound energy could be converted into electricity as the diaphragm electric coil convert magnetic strain to electric energy. And thus this sound energy could be used to perform various tasks by converting it into useful electric energy.

In dynamic microphones (aka moving-coil microphones), a coil of wire surrounds a magnet and is connected to a diaphragm which vibrates in response to incoming sound waves. When sound waves hit the diaphragm, the coil oscillates back and forth past the magnet, generating a current which creates the audio signal. We use same diaphragm material used for the conversion of noise pollution to green energy and into electric energy. Diaphragm are the coil which converts sound to magnetic flux to electric energy. The strain applied to diaphragm coil by sound energy could be converted into electricity.

3.2 Super-Capacitor

Super capacitor is also called as ultra-capacitors. Ultra capacitors are electrical energy storage devices that have the ability to store a large amount of electrical charge. Ultra capacitors are another type of capacitor which is constructed to have a large conductive plate, called an electrode, surface area as well as a very small distance between them. Unlike conventional capacitors that use a solid and dry dielectric material such as Teflon, Polyethylene, Paper, etc., the ultra-capacitor uses a liquid or wet electrolyte between its electrodes making it more of an electrochemical device similar to an electrolytic capacitor. Although an ultra-capacitor is a type of electrochemical device, no chemical reactions are involved in the storing of its electrical energy. This means that the ultra-capacitor remains effectively an electrostatic device storing its electrical energy in the form of an electric field between its two conducting electrodes as shown.

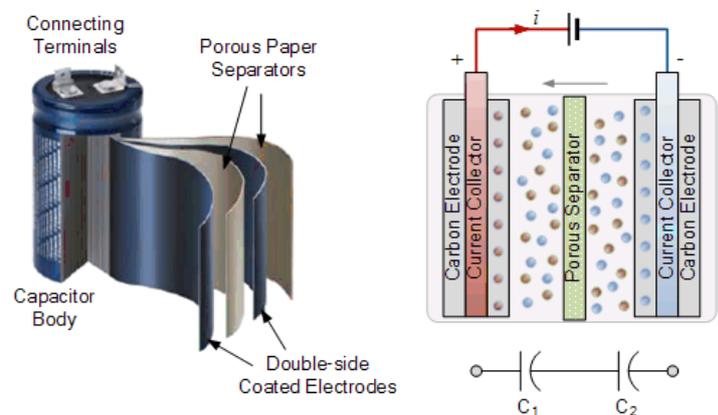


Fig.1:- Super capacitor

3.3 DC Charging Circuit

The circuitry to recharge the batteries in a portable product is an important part of any power supply design. The complexity (and cost) of the charging system is primarily dependent on the type of battery and the recharge time.

A battery charger consists of a rectifier circuit, power circuit, ripple monitoring, control circuit, regulator circuit, and fault detection circuit. This charger can also be used as a DC source for a control and protection circuit of a substation during normal operation, or to charge the battery in floating mode. When there is a problem in the AC system, then the battery supplies the DC loads in a substation. There are two types of charging modes: the first is the fast charging for a new or unused batteries, and the second is the floating charge to charge the batteries in service and supply a load to compensate for the small charge lost by the battery in service.

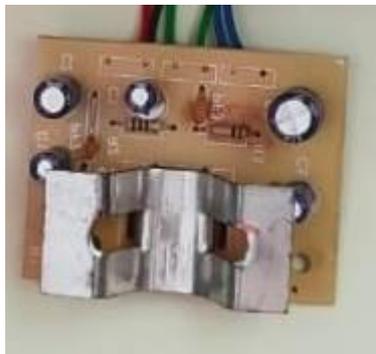


Fig. 2:- DC Charging Circuit

3.4. Battery

Battery (electricity), an array of electrochemical cells for electricity storage, either individually linked or individually linked and housed in a single unit. An electrical battery is a combination of one or more electrochemical cells, used to convert stored chemical energy into electrical energy. Batteries may be used once and discarded, or recharged for years as in standby power applications. Miniature cells are used to power devices such as hearing aids and wristwatches; larger batteries provide standby power for telephone exchanges or computer data centres.



Fig. 3:- Battery

3.5 Inverter

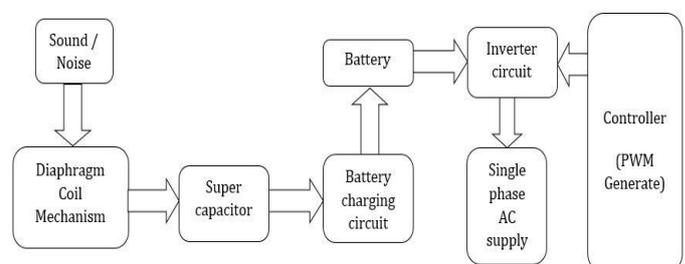
An inverter is an electrical device that converts direct current (dc) to alternating current (ac); the converted ac can be at any required voltage and frequency with the use of appropriate transformers, switching, and control circuits. Solid-state inverters have no moving parts and are used in a wide range of applications, from small switching power supplies in computers, to large electric utility high-voltage direct current applications that transport bulk power. Inverters are commonly used to supply ac power from dc sources such as solar panels or batteries.

There are two main types of inverter. The output of a modified sine wave inverter is similar to a square wave output except that the output goes to zero volts for a time before switching positive or negative. It is simple and low cost and is compatible with most electronic devices, except for sensitive or specialized equipment, for example certain laser printers. A pure sine wave inverter produces a nearly perfect sine wave output (<3% total- harmonic distortion) that is essentially the same as utility-supplied grid power. Thus it is compatible with all ac electronic devices. This is the type used in grid-tie inverters. Its design is more complex, and costs 5 or 10 times more per unit power. The electrical inverter is a high-power electronic oscillator. It is so named because early mechanical ac to dc converters was made to work in reverse, and thus were "inverted", to convert dc to ac. The inverter performs the opposite function of a rectifier.



Fig. 4:- Inverter

4. BLOCK DIAGRAM



5. CONSTRUCTION

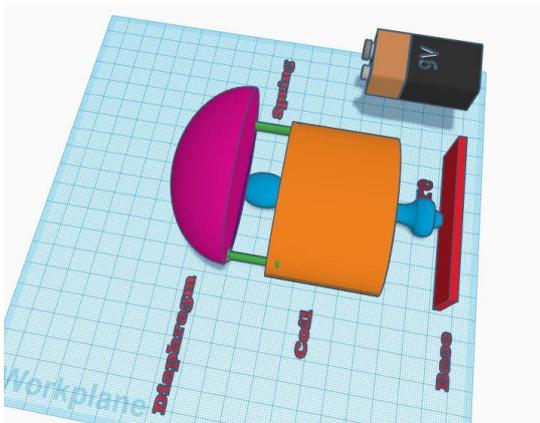


Fig. 5:- Construction top view

The proposed device consists of two parts: mechanical part and electric part. Mechanical part is the primary part in the system. Sound is directly bombarded on the diaphragm which is fixed at another end by spring hold mechanism. Electrical part consist of coil and permanent magnet. Permanent magnet rod also called as core. Magnet rod is fixed at base. Coil along with spring hold attachments it is placed such that it surrounds the magnet rod. Vibrations of sounds are pass toward the coil so back and forth movement of the coil can occur.

6. WORKING

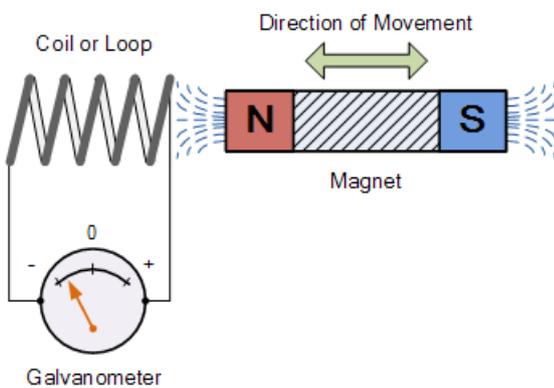


Fig. 6:- Electromagnetic Induction

Electromagnetic Induction was first discovered way back in the 1830's by Michael Faraday. Faraday noticed that when he moved a permanent magnet in and out of a coil or a single loop of wire it induced an Electromotive Force or emf, in other words a voltage, and therefore a current was produced.

The discovery and understanding of electromagnetic induction are based on a long series of experiments carried out by Faraday and Henry. From the experimental observations, Faraday arrived at a conclusion that an emf is induced in the coil when the magnetic flux across the coil changes with time. With this in mind, Faraday formulated his first law of electromagnetic induction as, whenever a

conductor is placed in a varying magnetic field, an electromotive force is induced. If the conductor circuit is closed, a current is induced which is called induced current.

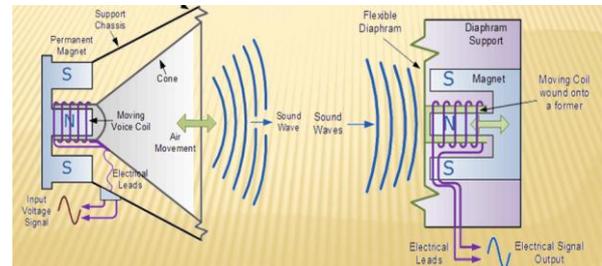


Fig. 7:- Loudspeaker as transducer

Proposed device works on similar principle like loudspeakers works. A loudspeaker (or speaker) is a transducer, which converts an electrical signal into sound waves. Sound waves will provide mechanical vibration to the diaphragm of the speaker so that the diaphragm starts oscillating, since the coil of copper wire is attached to the diaphragm of the speaker, the coil will start oscillating and then due to back and forth movement of the coil an electric field will be produced due to the magnets placed near the coil, which gives the electrical energy from the outlet point of the speaker. Since this output electrical energy is non-continuous so we will use ultra-capacitor for storage purpose. The moment when the capacitor becomes full it starts giving continuous flow of output current. By using capacitor we can get maximum amount of current in a continuous way. This output of capacitor is stored into the battery by means of charging circuit and then further it is given to the inverter for many purposeful uses.

7. CONCLUSION

Many form of energy that we don't have notice about them but they may play vital role in our daily life. Sound is of the energy source that we have discovered that can be utilized for production of electricity. This energy source have the potential to meet the future growing electrical sector. This device utilize the noise pollution. This source (noise) can become a renewable source of energy and eco-friendly.

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