

Internship (498R)

Noise Utilization as an Approach to Conversion to Mechanical Energy

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Declaration

This is to declare that no part of this report or the project has been previously submitted elsewhere for the fulfillment of any other degree or program. Proper acknowledgement has been provided for any material that has been taken from previously published sources in the bibliography section of this report.

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Approval

The Research Project entitled “**Noise Utilization As An Approach To Conversion To Mechanical Energy**” by Sadman Sakib Noel (ID#1510202043), Zarin Tasnim (ID#1610993042) and Shehzin Masud (ID#1620690042) has been accepted as satisfactory and approved for partial fulfillment of the requirement of BS in EEE/ETE/CSE 498r degree program on April, 2021.

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Abstract

Our research paper targets generating useful energy from wasted energy. Energy is the primary indicator of a nation's progress, and it is the starting point for a complex chain of other issues. The dependence all over the country is in generating energy from non-renewable sources, which cause outstanding pollution issues. We found that the majority of any country does not rely on renewable energy sources. And about the consumption of energy based on the statistics of the ministry of electricity and energy, there is about 5,000 microwatt of missing electricity caused by lack of power plants' efficiency and maintenance. Egypt's total production is 123.920 kilowatts/hour, while the total output of the United States is 4125.675 kilowatts/hour. The only thing that appears clearly from this comparison is that we don't utilize our energy resources, so we need to find new sources of alternative energy. Most of the countries that suffer from high energy demand and low production. So, to reduce this large gap, we introduce our idea, generating electricity from sound, which has high efficiency. Using the wasted energy source (sound energy), after we got the idea, a prototype, and test the plan was made, and we found that our prototype produces 10 volts of electric power. To be sure, from our testing plan, we try to charge the battery, and it was captured. The prototype can be implemented anywhere because it has achieved the design requirements like high efficiency, safety, and ecofriendly Keywords- Sound Energy- Mechanical Waves- Wasted Energy- Piezoelectric.

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Chapter 1

Project Overview

1.1 Introduction:

In our normal life there is greater need of electricity, without the electricity many of our work will shut down and stuck at the same point. There is a greater need and huge amount of electricity is required so various methods are adopted for the production of electricity. But use of electricity at high rate and devastation also, thus requires the alternate a source of energy that not only produce the electricity but become a convenient way to produce high electric energy advantageous. New and creative method are used produce electricity is something different and valuable. It has disclosed the new dimensions in the field of electricity. We always eager to find out and also how noise pollution can be used to convert into electricity. 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. There are various so called eco-friendly sources of energy that we have discovered till the present artificial era. Some of them are implemented to great extent under the suitable circumstances to overcome the short run of the energy due to technological boom that has led the energy needs to its apex. Solar energy is one in the list that came up with the wide range of applications such as solar heaters; solar cookers and it gained success due to its easy implementation. There are various other sources of renewable energy which includes harnessing energy from wind, Biomass, water etc. But the efficiency of the energy sources discussed above is the major issue over which the scientists are working since long. The efficiency of the solar cell is 20% only under the practical conditions.

This is not the only problem with present sources it further extends to high cost involved in production process. Thus the researchers now are feeling the need of other kinds of sources to harness energy for our conventional uses. To add to the list there is an emerging scenario which leads us to a new renewable energy source known to us since long and that is the sound. The sound or noise in other terms is present all around us. So why not use it to satisfy our needs of energy. In our basic applications we see sound be converted in the electrical signals to travel over the media for communication purposes. For example the 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. 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. 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. But have we ever imagined sound as source of electricity? No, is the answer. This is because it was stone which was left unturned by the researchers up till now but this hidden source is now emerging as the a new era in the world of renewable sources of energy. This could be easily understood by the “law of thermodynamics” which states that the mechanical energy can be converted to electrical energy.

1.2 What is Conversion of Noise to Electrical 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.

1.2.1 Characteristics of 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] Piezoelectric materials exhibit intrinsic (spontaneous) polarization. Most of the piezoelectric materials are ceramic in nature, barium titan ate 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]

1.2.2 Applications of Free Energy

Our project will commonly use for daily life electrical energy for device. Though according to studies Smart Wireless Charger By Using Audio, wind and Friction Source can be used to manage and save the energy and use in highway road, sound noise industry, mobile phone, and any kind of device which create noise.

1.2.3 Pros and Cons

While convenient, Smart Wireless Charger By Using Audio, wind and Friction Source still has a few issues to work through, as it is continuously developed. The pros of Smart Wireless Charger By Using Audio, wind and Friction Source recognition of free energy and reduce government electricity producing cost and most important think is it can use any emergency situation to produce energy.

1.2.4 List of Equipment's

- MIC
- BC547 Transistor
- Resistor 1K,470 Ω ,4.7K 2.2K,100K
- Capacitor 0.1 μ f, 100 μ f, 10 μ f
- 555 IC
- LED
- Capacitor 0.1 μ f, 100 μ f, 10 μ f
- Rectifier circuit
- Voltage meter

1.3 Our proposed project

The main idea of our project was to Noise Utilization as an Approach to Conversion to Mechanical Energy.

1.3.1 Description of the idea:

- Here in this master project we will build smart systems that can help to manage an energy and reduce cost. Also people can use it emergency situation
- Actually this master project is a combination of three method. These are useable, effective, controlling device and Smart emergency system of human life.
- This project aim to produce energy and reduce producing cost.

1.4 Motivation

Technology has always been developed very rapidly by and for the able people. Upon close speculation, we can see that most of the modern day innovations are for the able bodied, and the most of the area are out of the electricity. Our objective was to design, develop something that would provide a useful and efficient means of doing daily work and store energy create daily life easier.

1.4 Summary

In this chapter, we have briefly described the basics of our project, existing hardware, and the main idea on which our project was built. We have described the usefulness of our project, what motivated us to design and build this system, and our accomplishments in here. The following chapters describe the details of the components used, the mechanical description, designs, and the overall structure of the system.

Chapter 2

Related work

2.1 Introduction

The existing work related in the world is very limited because this concept totally new. In recent time most of the country was try to implementation in their country. we hope that our concept will be establish.

2.2 Related Work & Objective

This research aimed to design and develop a device that has the ability to convert noise into electricity and store it for emergency use. The specific objectives were as follows: To determine the components needed to develop the noise pollution based power bank in terms 2017 International Research Conference on Higher Education of Hardware and Software to describe the noise pollution based power bank circuitry and design architecture; to determine the noise or decibels to be harvested to create power; process the noise into power as source of electricity; and to determine how much electricity do the noise pollution based power bank will generate voltage, current, and resistance; to determine the efficiency of the Noise Pollution Based Power Bank when tested using different mobile gadgets abdication and finally, the software design which contains the details for the software side of the project such as a data flow diagram (DFD) illustrates how data is processed by a system in terms of inputs and output

2.3 How it is related to Bangladesh

Our country is very populated country and developing country. we need more energy in our industry. Our project will be create more options and reduce government electricity producing cost. That time it's very easy to apply. We can use our device any high way road, public road, inside the mobile or any sound polluted device.

2.4 Summary

The existing work related to Smart Wireless Charger By Using Audio, wind and Friction Sourcethat we found useful have been described in this section. The next chapter elaborates more on the theoretical part of our project.

Chapter 3

Equipment's details

3.1 Introduction

In our project we have used electromagnetic field, MIC, transistor, capacitor to run the robot according to given smart output. Circumstances that we find ourselves in today in the field of microcontrollers had their beginnings in the development of technology of integrated circuits. This development has made it possible to store hundreds of thousands of transistors into one chip. That was a prerequisite for production of microprocessors, and the first computers were made by adding external peripherals such as memory, input-output lines, timers and other. Further increasing of the volume of the package resulted in creation of integrated circuits. These integrated circuits contained both processor and peripherals.

3.2 MIC

A microphone is a device that translates sound vibrations in the air into electronic signals or scribes them to a recording medium. Microphones enable many types of audio recording devices for purposes including communications of many kinds, as well as music and speech recording.[8]



Fig1: MIC

3.3 BC547 Transistor

A transistor is a device that regulates current or voltage flow and acts as a switch or gate for electronic signals. Transistors consist of three layers of a semiconductor material, each capable of carrying a current. The transistor was invented by three scientists at the Bell Laboratories in 1947, and it rapidly replaced the vacuum tube as an electronic signal regulator.

A transistor regulates current or voltage flow and acts as a switch or gate for electronic signals. A transistor consists of three layers of a semiconductor material, each capable of carrying a current. A semiconductor is a material such as germanium and silicon that conducts electricity in a "semi-



Fig2: Transistor

Enthusiastic" way. It's somewhere between a real conductor such as copper and an insulator (like the plastic wrapped around wires). The semiconductor material is given special properties by a chemical process called doping. The doping results in a material that either adds extra electrons to the material (which is then called N-type for the extra negative charge carriers) or creates "holes" in the material's crystal structure (which is then called P-type because it results in more positive charge carriers). The transistor's three-layer structure contains an N-type semiconductor layer sandwiched between P-type layers (a PNP configuration) or a P-type layer between N-type layers (an NPN configuration). A small change in the current or voltage at the inner semiconductor layer (which acts as the control electrode) produces a large, rapid change in the current passing through the entire component. The component can thus act as a switch, opening and closing an electronic gate many times per second. Today's computers use circuitry made with complementary metal oxide semiconductor (CMOS) technology. CMOS uses two complementary transistors per gate (one with N-type material; the other with P-type material). When one transistor is maintaining a logic state, it requires almost no power. Transistors are the basic elements in integrated circuits (IC).

The Transistor is a three terminal solid state device which is formed by connecting two diodes back to back. Hence it has got two PN junctions. Three terminals are drawn out of the three semiconductor materials present in it. This type of connection offers two types of transistors

3.4 Resistor

A resistor is a passive two-terminal electrical component that implements electrical resistance as a circuit element. In electronic circuits, resistors are used to reduce current flow, adjust signal levels, to divide voltages, bias active elements, and terminate transmission lines, among other uses.

3.5 Capacitor

Capacitors are electronic components that store, filter and regulate electrical energy and current flow and are one of the essential passive components used in circuit boards. Capacitors are primarily used for storing electrical charges, conducting alternating current (AC), and blocking or separating different voltages levels of direct current (DC) source. While capacitors are one type of component, there are many types of capacitors that are differentiated by the materials used in construction, each providing unique features and benefits. Understanding basic capacitor construction and how different materials can affect their characteristics will aid in choosing the proper capacitor for a given application. The unit of capacitance is the farad. For 1 farad of capacitance, 1 coulomb of charge is stored on the plates when 1 volt is applied: 1

$$\text{farad} = 1 \text{ coulomb} / 1 \text{ volt} \quad 1 \text{ coulomb represents } \sim 6 \times 10^{19} \text{ electrons}$$

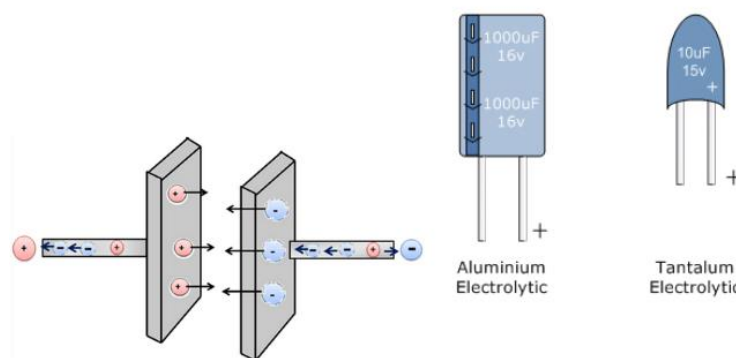


Fig3: Capacitor

The properties of the dielectric also influence the volumetric efficiency of the capacitor. This is an important consideration when designing portable systems or very densely populated circuit boards, where high capacitance is required within small component dimensions. Volumetric efficiency is the amount of capacitance that can be provided within a given volume, and is expressed as a CV value where C is capacitance and V is voltage. A high CV is required for high volumetric efficiency. Tantalum dielectrics are known for their high CV properties. Optimizing the physical design of the capacitor, for example by maximizing the usable electrode surface area and minimizing package overheads, also helps increase the CV of the end product.

3.6 Introduction Pizo Electromagnetic

A piezoelectric crystal is placed between two metal plates. At this point the material is in perfect balance and does not conduct an electric current. Mechanical pressure is then applied to the material by the metal plates, which forces the electric charges within the crystal out of balance

3.7 Introduction Rectifier circuit Rectifier circuit

Rectification is the conversion of alternating current (AC) to direct current (DC). ... A full-wave rectifier is a circuit that converts both half-cycles of the AC voltage waveform to an unbroken series of voltage pulses of the same polarity

Chapter 4

Design Impact

4.1 Introduction

The different ways in which our designed project leaves an impact, and how its manufacturability and sustainability may be is discussed in this chapter.

4.2 Economic impact

Our system is industrially profitable. This could save up time and could positively affect the economy. However, if it is primarily used by those who are not able to purchase or generate electricity supply, the economic impact would not be that significant, as poor people only constitute a minor portion of the society. Thus it can be expected to affect the economy in a positive way.

4.3 Environmental impact

Our project is free from all sorts of materials and chemicals that may harm the wild life or the environment. Though our project may not aid the environmental development, it in no way harms it. So it is safe to say that our project does not have any negative environmental impact.

4.4 Social impact

Our project can be put to a wide range of uses. It can be used by rural area and people can use the energy with low cost.

4.5 Political impact

Our project does not have any direct impact on the political aspect.

4.6 Ethical impact

The aim of our project is to aid the rural area, and to help make people's life easier, and open up new possibilities for research and development in this field. It intends to help people. Thus it can be said that the project has a positive ethical impact.

4.7 Health and safety impact

The vision for the project was to positively impact the health and safety of its user. The project is meant to help poor area and people live a better life. Another point worth mentioning is that our project does not use any harmful chemicals or substances, or emit any harmful radiation that could negatively affect the manufacturers, users or the environment. Thus we can say that it has an overall positive health and safety impact.

4.8 Manufacturability

Our project components are widely available. The mechanical design is simple and has been precisely documented. Thus it would not be a complex system to manufacture.

4.9 Sustainability

There is very little chance of the components breaking down, loosening, or falling apart. The design is expected to be durable and resistant to pressure or stress of any kind. Thus it is expected to sustain for a long period of time.

4.10 Summary

The different aspects of this project's impact and its manufacturability and sustainability have been discussed in this chapter.

Chapter 5

Final Project & Discussion

5.1 Introduction

In our daily life there is greater need of electricity, without the electricity many of our work will shut down and stuck at the same point. There is a greater need and huge amount of electricity is required so various methods are adopted for the production of electricity. But use of electricity art high rate and devastation also, thus requires the alternate a source of energy that not only produces the electricity but become a convenient way to produce high electric energy advantageous. New and creative method are used produce electricity is something different and valuable .It has disclosed the new dimensions in the field of electricity. We always eager to find out and also hoe noise pollution can be used to convert into electricity. In our project we use different types of methods. Which produce the mechanical energy through noise, wind flow and high pressure on surface.

5.2Final Circuit Diagram

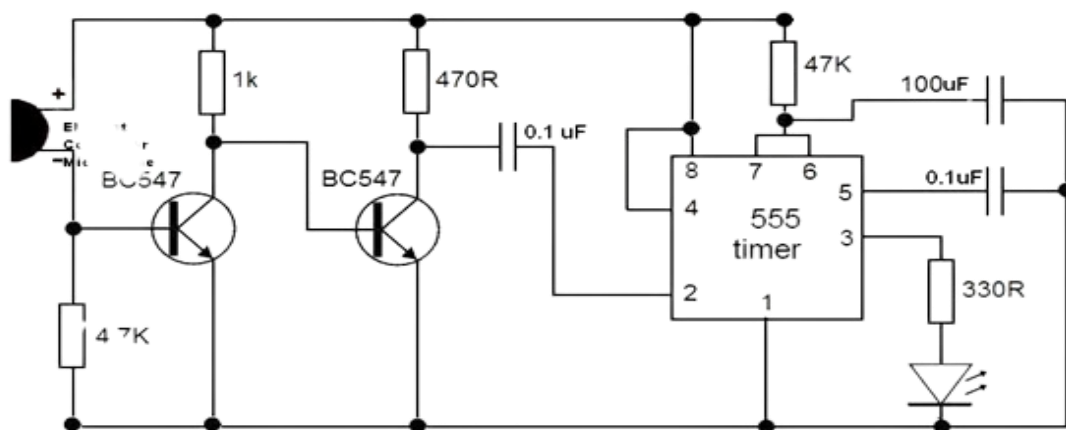


Fig4: Circuit diagram for noise energy

5.3 Block Diagram

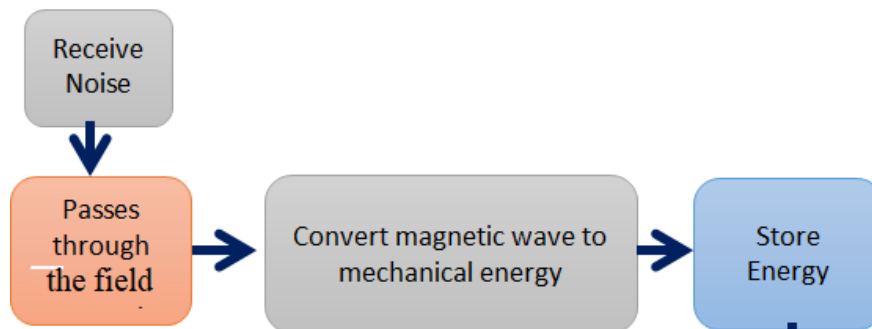


Fig5: Block diagram for noise energy

5.4 Project Results & Discussion

In our project we see that noise energy has a lot of potential in it and if properly harnessed then it can help solve the energy crises in the world. The project showed that how it can be properly designed and used to get the maximum output voltage. The power electronic circuitries have helped the concept of wind and friction power a lot

5.5 Considerations and constraints of projects

- Low cost project and need to high flow wind and noise area.
- Electric material are available ,but after one or two years magnetic energy will be reduce and need to maintenance Equipment's are ecofriendly and possession long area

5. 6 Full Projects Project Design:

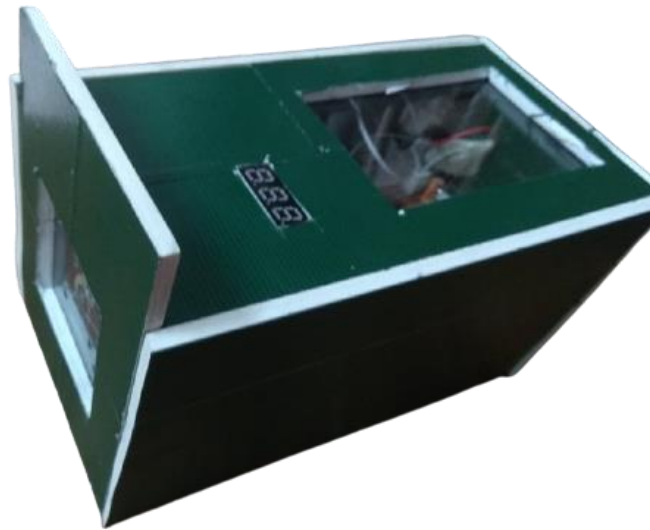


Fig6: Full Project View

Chapter 6

Conclusion

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 quite 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. And the study of electromagnetic field and its characteristics showed that how it can be properly designed and used to get the maximum output. The power electronic circuitries have helped the concept of wind power a lot. Without them this concept would have been too expensive and farfetched. With the thermistors and converters being used not only the operations have been smoothened but also the efficiency has been increased to a great extent. From the voltage stability analysis it was showed that how a doubly fed induction generator has superior characteristics than a simple induction generator. This report also showed the integration of farms with the transmission grid and the problems associated with it and the probable solutions that can be applied to solve them and have a better performance.

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