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Generation Of Electricity Using Sound

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Abstract— *In the search for alternative energy sources there's one form of energy you don't hear much about, which is ironic because we are referring to sound 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. This project suggesting a concept to convert ambient noise (sound in the form of wave energy) to power a mobile phone or generate energy for the national grid from rush hour traffic.*

I. INTRODUCTION

“There is definitely energy contained in that sound,” says David Cohen-Tanugi, vice president of the MIT Energy Club and a John S. Hennessy Fellow in MIT’s Materials Science and Engineering department. “But the density of the energy is very low, and there is no way to capture it all. You’d have to have obscenely loud, continuous noise for harvesting to be worthwhile.” Sound energy is the energy produced by sound vibrations as they travel through a specific medium. Speakers use electricity to generate sound waves and now by using zinc oxide, the main ingredient of calamine lotion, to do the reverse - convert sound waves into electricity. Piezoelectric are materials capable of turning mechanical energy into electricity, and can be substances as simple as cane sugar, bones, or quartz. Much research in this field has been focused on transforming the movement of a person running, or even the impact of a bullet, into a small electrical current, but although these advanced applications are not yet available in consumer products, scientists have been using piezoelectric materials in environmental sensors and speakers for years. Piezoelectric create an electrical charge under stress, and thus zinc oxide, the main ingredient of calamine lotion, was bent into a field of nanowires sandwiched between two electrodes. The researchers subjected the sandwich to sound waves of 100 decibels which produced an electrical current of about 50 mill volts. Passing trains and subways aren’t only loud, but their surroundings rattle and vibrate as they pass, and part of the thrill of a rock concert is feeling the whole auditorium shake. 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 as piezo materials convert sound energy to electric energy. Transducer is also used to convert Mechanical energy to electric energy i.e.it can convert sound energy to electric energy the simple e.g. of use of transducer to convert sound to electric and vice versa is in speakers, headset also it could be converted into electric energy.

II. LITERATURE SURVEY

White, N.M., Glynne-Jones, P. and Beeby, S.P. (2001) A novel thick-film piezoelectric micro-generator. Smart Materials and Structures, 10, (4), 850- 852. Piezoelectric materials have the ability to transform mechanical strain energy into electrical charge. The amount of energy generated depends on the number of passing vehicles and the number of piezoelectric elements on the atmosphere.

Katzir, S. (2012-06-20). "Who knew piezoelectricity? Rutherford and Langevin on submarine detection and the invention of sonar". Notes Rec. R. Soc. 66 (2): 141–157. Crystals which acquire a charge when compressed, twisted or distorted are said to be piezoelectric. This provides a convenient transducer effect between electrical and mechanical oscillations. The generation of an electric charge in certain nonconducting materials, such as quartz crystals and ceramics, when they are subjected to mechanical stress (such as pressure or vibration), or the generation of vibrations in such materials when they are subjected to an electric field.

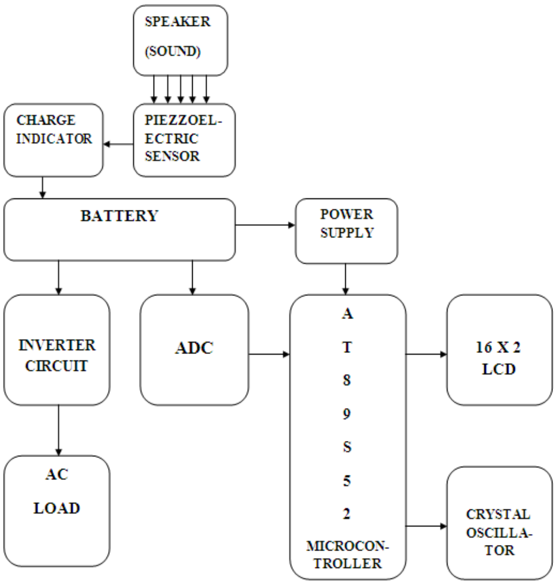
Manbachi, A. and Cobbold R.S.C. (2011). "Development and Application of Piezoelectric Materials for Ultrasound Generation and Detection". Ultrasound 19 (4): 187–196. The electricity generation experiment was done by using a sound wave convertor extract sound wave energy from the loudspeaker. In this study, PZT piezoelectric actuator is used as a sound wave energy convertor.

Bernard Jaffe, W. R. Cook and H. Jaffe “Piezoelectric Ceramic,” Academic Press London and New York, 1971. Internal structure is deformed, separation of charge centers and dipoles are generated Poles inside material are mutually Cancelled and charge occurs on surface creates polarization on the surface of material.

Kishor B. Waghulde and Dr. Bimlesh Kumar, “Vibration Analysis and Control of Piezoelectric Smart Structures by Feedback Controller Along- with Spectra Plus Software”, International Journal of Mechanical Engineering &

Technology (IJMET), Volume 3, Issue 2, 2012, pp. 783 - 795, ISSN Print: 0976 – 6340, ISSN Online: 0976 – 6359. Longitudinal waves are of alternating pressure deviation from the equilibrium pressure, causing local region of compression and rarefaction, while transverse wave (in solid) are waves of alternating shear and stress at right angle to the direction of propagation.

III. BLOCK DIAGRAM



Figuer1: Block diagram based on energy generation using sound.

Sensors

Four sensors are used which will capture the pressure of the sound present in the environment according to which the transducer will generate the electricity.

Inverter circuit

It will store the energy in AC form for further use.

Battery

The battery is an electrochemical device for converting chemical energy into electrical energy. The main purpose of the battery is to provide a supply of current for operating the cranking motor and other electrical units. Capcity of battery-12v.

Charge indicator

It indicates the amount of charge in the battery.

ADC

It is a analog to digital conversion. Here, the input physical quantity is converted into digital form.

Power Supply

Power supply having 5V and 500mA.

AT89S52 microcontroller

Here, we are using microcontroller AT89S52 which allows dynamic and faster control. It is similar as 8051 uc.

LCD

The alphanumeric LCD is used here. It is a 16*2 LCD. It makes the system user friendly.

Contrast Control

It is used to control the contrast of the LCD.

IV. CIRCUIT DIAGRAM

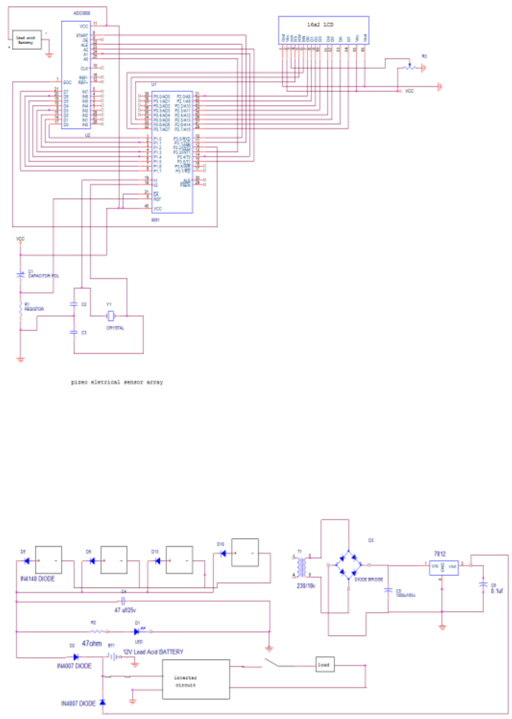


Figure2: Overall circuit diagram of system

V. FUTURE OUTCOME/ CONCLUSION

Thus our project concludes that sound energy systems must be implemented to overcome increasing electricity crisis. In this work, a portable sound regulated electricity generation system can be implemented in mobile systems for charging the battery without use of portable charger, traffic signals for generation of electricity.

The system was designed based on the principle of a piezoelectric material module to generate electricity. The sensors used generates sufficient amount of electricity.

In order to utilize this waste energy, sound energy was integrated to power generation with the use of piezoelectric material in order to drive the system.

VI. APPLICATIONS

1. It can be uses as remote place where electric supply is not available.
2. In restaurants /hotels
3. At public places
4. ultrasonic areas like airports,near rocket launchers.
5. charging any equipments.
6. Military applications

VII. ADVANTAGES

1.Does not require any external power supply.
2.Can store power in a battery.

3.Depending upon the generation it can light upto the complete street.
4.Waste sound energy can be reused.
5.Even if the system charged excessively the system will not get affected.

REFERENCES

[1] *White, N.M., Glynne-Jones, P. and Beeby, S.P. (2001) A novel thick-film piezoelectric micro-generator. Smart Materials and Structures, 10, (4), 850- 852.*

[2] Abbasi, Aqsa. "Application of Piezoelectric Materials and Piezoelectric Network for Smart Roads." International Journal of Electrical and Computer Engineering (IJECE) Vol.3, No.6 (2013), pp. 857-862.

[3] Holler, F. James; Skoog, Douglas A; Crouch, Stanley R (2007). "Chapter 1". Principles of Instrumental Analysis (6th ed.). Cengage Learning. p. 9. ISBN 978-0-495-01201-6.

[4] Manbachi, A. and Cobbold R.S.C. (2011). "Development and Application of Piezoelectric Materials for Ultrasound Generation and Detection". Ultrasound 19 (4): 187–196.

[5] Gautschi, G (2002). Piezoelectric Sensorics: Force, Strain, Pressure, Acceleration and Acoustic Emission Sensors, Materials and Amplifiers. Springer.

[6] Katzir, S. (2012-06-20). "Who knew piezoelectricity? Rutherford and Langevin on submarine detection and the invention of sonar". Notes Rec. R. Soc. 66 (2): 141–157.

[7] S. Trolier-McKinstry (2008). "Chapter3: Crystal Chemistry of Piezoelectric Materials". In A. Safari, E.K. Akdo˘gan. Piezoelectric and Acoustic Materials for Transducer Applications. New York: Springer. ISBN 978-0-387-76538-9.

[8] Kochervinskii, V (2003). "Piezoelectricity in Crystallizing Ferroelectric Polymers". Crystallography Reports 48 (4): 649–675.

[9] Fotiadis, D.I; Foutsitzi, G., and Massalas, C.V (1999). "Wave propagation modeling in human long bones". Acta Mechanica 137: 65–81.

[10] Lee, BY; Zhang, J; Zueger, C; Chung, WJ; Yoo, SY; Wang, E; Meyer, J; Ramesh, R; Lee, SW (2012). "Virus-based piezoelectric energy generation.". Nature nanotechnology 7 (6): 351–6.

[11] Gurdal, Erkan A.; Ural, Seyit O.; Park, Hwi-Yeol; Nahm, Sahn; Uchino, Kenji (2011). "High Power (Na0.5K0.5) NbO3-Based Lead-Free Piezoelectric Transformer". Japanese Journal of Applied Physics 50 (2): 027-101.

[12] Website/ URL at www.merriam-webster.com

[13] Sensor Sense: Piezoelectric Force Sensors, at [15] Damjanovic, Dragan (1998). "Ferroelectric, dielectric and piezoelectric properties of ferroelectric thin films and ceramics". Reports on Progress in Physics 61 (9): 1267–1324.

[14] M. Birkholz (1995). "Crystal-field induced dipoles in heteropolar crystals – II. physical significance". Z. Phys. B 96 (3): 333–340.

15] Damjanovic, Dragan (1998). "Ferroelectric, dielectric and piezoelectric properties of ferroelectric thin films and ceramics". Reports on Progress in Physics 61 (9): 1267–1324.

[16] Kochervinskii, V (2003). "Piezoelectricity in Crystallizing Ferroelectric Polymers". Crystallography Reports 48 (4): 649–675.