ENERGY GENERATION USING PIEZOELECTRIC MATERIAL

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ABSTRACT

The applications of electronic devices with low power consumption, such as wireless sensor network and electronic communication devices, are rapidly increasing. Thus, utilizing environmental energy as an alternative to electrochemical battery, which has a finite lifespan, can be a great advantage to these electronic devices. Harvesting environmental energy, such as solar, thermal, wind flow, water current, and raindrops, has attracted increasing research interest in the field of energy harvesting. In this paper, harvesting sound energy in the form of pressure waves is investigated as an alternative to existing energy harvesting methods. In the experimental work, a piezoelectric generator lead zirconate titanate (PZT-5A) cantilever type is used to extract sound energy from the loudspeaker from various distances and then to convert this energy into electrical energy. A direct piezoelectric effect operating in 31 coupling mode is used. The maximum voltage generated by the piezoelectric generator occurs when its resonant frequency is operating near the frequency of sound. An analytical method with an appropriate equation is used to determine the resonant frequency and is then validated using the experimental result. The result shows that the maximum output voltage of 26.7 mVrms was obtained with the sound intensity of 78.6 dB at resonant frequency of 62 Hz at 1 cm distance in the first mode. In the second mode, the maximum output voltage of 91 mVrms was obtained with the sound intensity of 102.6 dB at resonant frequency of 374 Hz at 1 cm distance which is larger than that of the first mode. However, for both modes, voltage decreases as distance increases..

KEYWORDS:- *piezoelectric sensor, photovoltaic sensor, pressure sensor,microcontroller, battery, mobile charging unit.*

I. INTRODUCTION:-

In our project we have decided to develop new method for generating electricity i.e. generates electricity form sound and from radiated light using piezoelectric material.

A. CONVERTING SOUND ENERGY TO ELECTRIC 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. Also according to law of thermodynamics mechanical energy could be converted into electricity. 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 material 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 by other methods which we will see in the paper.

B. CONVERTING RADIATED LIGHT ENERGY TO ELECTRIC ENERGY

A typical silicon PV cell is composed of a thin wafer consisting of an ultra-thin layer of phosphorus-doped (N-type) silicon on top of a thicker layer of boron-doped (P-type) silicon. An electrical field is created near the top surface of the cell where these two materials are in contact, called the P-N junction. When sunlight strikes the surface of a PV cell, this electrical field provides momentum and direction to light-stimulated electrons, resulting in a flow of current when the solar cell is connected to an electrical load

II. DESIGN OF POWER GENERATION FROM WASTE ENERGY SYSTEM

The following are the important elements in the block diagram:-

- microcontroller
- Power supply
- Piezoelectric sound sensor
- Photo voltaic electric sensor

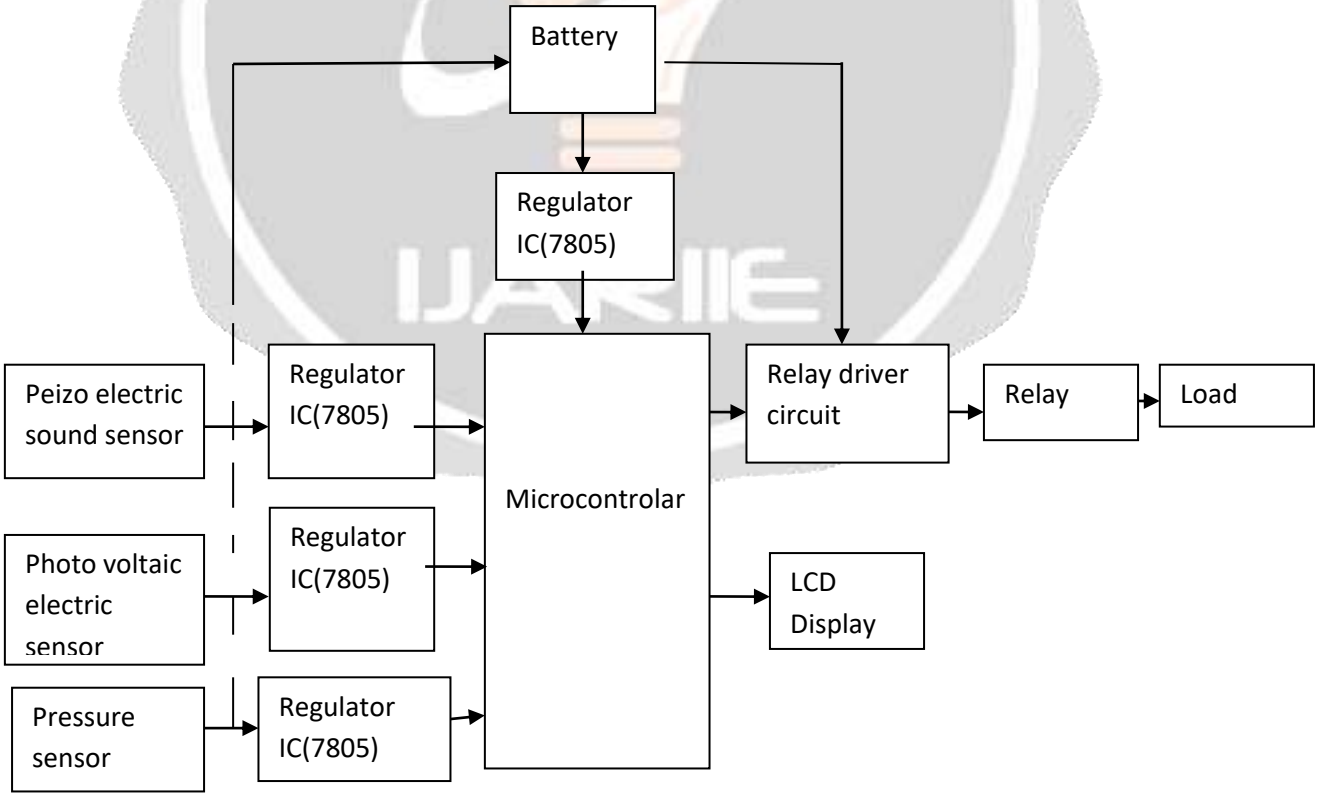

Figure1 - Block Diagram of Energy generation using piezoelectric material

III. WORKING:-

The photovoltaic sensor is also use to convert radiated light energy Example Street light or tube light use in homes into electrical energy. Sound energy is also converting to electric energy by using piezoelectric sensor. We are taking Piezo electric sensor having a high sensibility as compare to piezoelectric sensor use in converting pressure. So proper amount of sound or noise, radiated light and pressure is applied to respective so at output we get electric energy. At the output of these two sensor we get electric energy which is not in proper amount .So by connecting signal conditioner(IC7805) at the output of this two sensor only 5volt is given to controller and remaining voltage which is produce by sensor is given to battery. At the output of battery we are using IC7805 to drive the arduino board. Mainly arduino board is use only for switching purpose and also to display that which sensor is use to charge the battery or given to controller. microcontroller will drive the relay driving only when the input is applied to sensors. At the output of really driving circuit relay is use which is act as a switch. We are using single pole double through (SPDT) relay as a switch. At the output of relay we are connecting a load that means mobile. In this way we can charge our mobile from waste of energy sources.

Specifications of microcontroller

- 8 Bit Microcontroller
- Fully Static Operation:0Hz to 24 MHz
- 4K Bytes of flash memory
- 128×8 Bit Internal RAM
- 32 Programmable I/O Pins
- Six Interrupt Sources
- Supply Voltage 5V
- Maximum Operating Voltage 6.6V
- Output Current 15mA

Specification of Signal conditioner

- 4K Bytes of flash memory
- 128×8 Bit Internal RAM
- 32 Programmable I/O Pins
- Six Interrupt Sources
- Supply Voltage 5V
- Maximum Operating Voltage 6.6V
- Output Current 15mA

Specification of sensors

- Sound sensor output voltage 5-12 volt.
- Pressure sensor output voltage 12-18volt.
- Solar sensor if full intensity of light is given then we get 12 volt.

IV. CONCLUSION:-

As sound is an abundant source of energy, we need to use it in an efficient manner. At this point of time, the production of sound may be an expensive process but the production of electricity from sound becomes a vital source of supply of input energy in the near future. The fuels being used to produce electricity today are „Non-Renewable" in nature. Hence, the proposed idea is a ray of hope for the generations to come that alternate sources of energy are on the anvil. Yet another striking feature of the proposed idea is that it does not create any pollution or generates residual bi-products which would open up a Pandora"s Box of related issue.

V. REFERENCES:-

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