

A NOVEL TECHNIQUE TO GENERATE ELECTRICITY FROM SOUND ENERGY

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Abstract: As we know the electricity is basic need in our day to day life and there is a different type of pollution in the world, and one of them is noise pollution. Noise is an unwanted sound, which creates pollution. In this paper developed new techniques to generate renewable energy. In this paper new way to generate electricity from sound energy and solar energy also to generate electricity to get more output from this hybrid model. It focuses on the feasibility and the ground zero application of the same. The prediction of the future development of these kind of sources of energy is emphasized other than commonly known ones such as solar energy, biogas, wind energy and so on. If sound energy is able to be converted into electric energy efficiently it could help us to reduce the scarcity of electrical energy across the globe. Hence there are many applications areas in which this technique can be utilized and electricity can be generated easily.

Index Terms: Sound energy; Piezo-electric generators; solar panel; Controller, Relay driver; converter.

I. INTRODUCTION

We all know everywhere there is huge scarcity of energy and for running most of our appliances and to carry out daily work we need electricity. It's really very difficult to imagine our life without electricity, our life would really stop so there is high need, to produce electricity at faster rate and find some other feasible method to produce electric energy. On the other hand we see that in this modern world there is lot of noise pollution in roads, airports, industries, etc. There are several methods for generating electricity, for which a lot of experiments are being conducted. Innovations in this field may lead to minimizing the use of non-renewable energy sources for electricity generation.

The technique developed new method for generating electricity from sound pollution. Sound is a mechanical form of energy which available in the form of wave. Also according to law of thermodynamics, mechanical energy could be converted into electricity. Transducer is also used to convert Mechanical energy to electric energy i.e. it can convert sound energy to electric energy. The simple example of use of transducer to convert sound to electric energy and vice versa is in speakers, headset, also it could be converted into electric energy by other methods. It can be used in lightning the street lights by using the noise pollution made by vehicles, it could also be used in industries, airport runways (as the sound pollution is to a great extent there, and the energy of sound here is very high so we will get pleasant output), also the electricity produced in nuclear power station could increase. It doesn't ends over here; there are many applications of it. Waste form of sound energy can be used for some creative purpose. Random unwanted noise can be as a source of electrical energy which can be converted by a transducer. The output of a transducer is enhanced by the use of boost converter device. The resultant electrical energy is stored in a battery such that it can be used for further applications. So it would not be wrong if in future we see sound energy as new source of power. As sound has enormous amount of energy with it, it can be used by converting it in electric energy.

II. LITERATURE SURVEY

Pressure is created from oscillation of mechanical waves, generated pressure is utilized to convert sound energy into mechanical energy and as per the law of thermodynamics this mechanical energy is converted into electrical energy, for this conversion Piezoelectric sensor is used to convert mechanical pressure 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. Solar panel is also used parallelly with piezoelectric sensor to make the hybrid model. But a limitation is that for working this model requires high decibel of sound and availability of solar radiations [1].

Random sound energy around us can be treated as a source of electric power after their efficient conversion using suitable transducer. Piezoelectric transducers are used for conversion of sounds into electric energy. The produced electric energy from multiple piezoelectric transducers are stored in multiple super capacitors which are they added and amplified through adder and voltage multiplier circuits. The resultant electric power was used to charge a rechargeable DC battery so as to store this energy. Random sound energy from numerous sources around us can be stored as electric energy which can be used later to deliver electric power to drive compatible small loads. In simple words, sound is the vibration of any substance. The piezoelectric effect is understood as the linear electromechanical interaction between the mechanical and the electrical state in some crystalline materials with no inversion symmetry [2].

The piezoelectric effect is the process of internal generation of electrical charge resulting from an applied mechanical force. The capacity of piezoelectric materials to receive any vibration and to convert that into electric signal attracted many researchers who tried to implement circuits and systems for converting pressure and vibrations into electric power. Sound energy can be converted into source of electric energy by using a suitable transducer. This can be done by using a transducer by converting vibrations caused by noise into electrical energy. The vibrations created by noise can be converted into electrical

energy through the principle of electromagnetic induction. The demonstrated ideas probe into a clean and readily available source of energy and solar energy. Sound waves are a form of mechanical energy[3].

III. BLOCK DIAGRAM

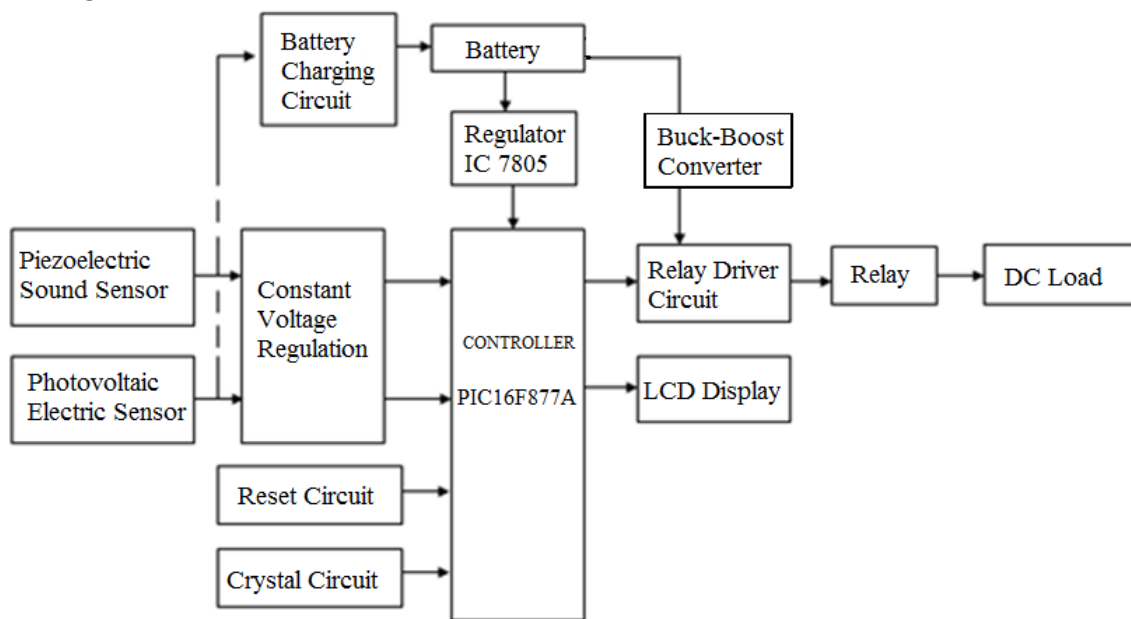


Figure 1. Block diagram of proposed system

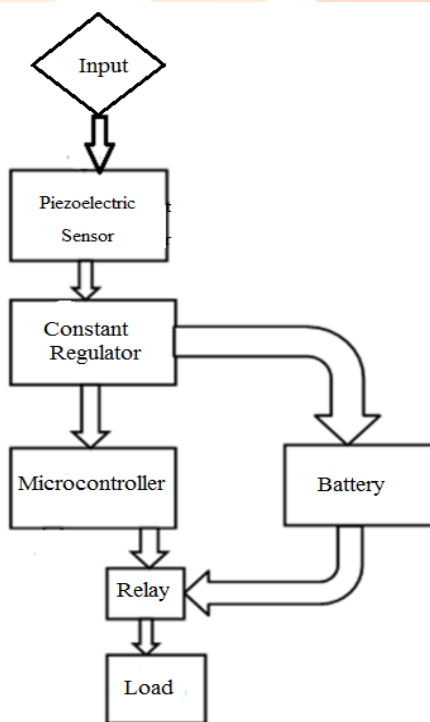


Figure 2-Flowchart

Above figure shows the block diagram representation for conversion of sound energy into electrical energy. In this technique of generation piezoelectric and photovoltaic sensors are used for conversion. The battery charging circuit is used for proper charging of battery. Battery is used as a backup for driving the load and also used storage. Regulator IC is used to regulate the supply and Relay driver circuit are used drive the relay. Microcontroller PIC16F877A is used for driving the system. Relay acts as a switch and controls the DC load. LCD display 16*2 is used to show the selected input and generated output voltage. DC load is operated by controller and battery. Reset circuit and reset circuit is used for microcontroller operation. Constant voltage regulation circuit is used to protect the microcontroller PIC16F877A. From variable input and provide the constant output to the Microcontroller PIC16F877A. Buck-boost is used to maintain supply to drive the load as per requirement of load.

IV. COMPONENT DESCRIPTION

PIEZOELECTRIC SENSOR:

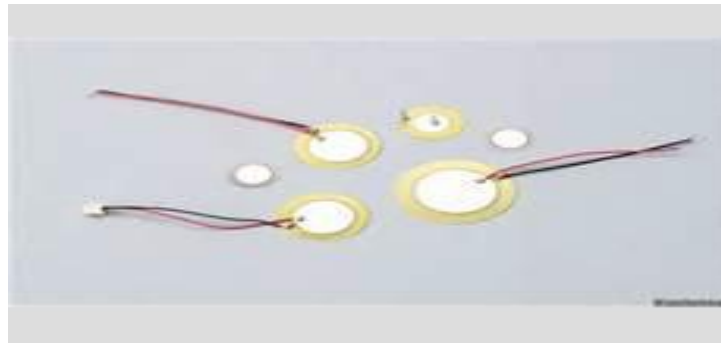


Figure 3. Piezoelectric Sensor

The Piezo electric sensor is shown in above fig. it works on thermodynamic law which state the mechanical energy is converted into electrical energy. The piezoelectric sensor is made up from ceramics (crystal), when sound input is available then the sensor generates output in the form of electrical energy.

LCD DISPLAY:

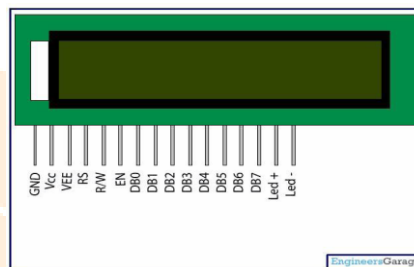


Figure 4. LCD Display

Liquid Crystal Display (LCD) screen is an electronic display module and find a wide range of application. These modules are preferred over seven segments and other multi segment LEDs. Thereasons being: LCDs are economical, easily programmable, having no limitation of displaying special and even custom characters, animation and so on. A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. A LCD 16x2 display has 16 pins as shown in fig. this LCD has two registers, namely command and data registers. The command register stores the command instructions given to the LCD to do a predefined task like initializing it, clearing its screen controlling display etc. the data register stores the data to be displayed on the LCD.

RECHARGEABLE BATTERY:



Figure 5. Battery

Battery is used for storing the energy coming from Light and piezoelectric sensor. In absence of input from both sensors battery provides supply to the microcontroller.

PHOTOVOLTAIC SENSOR:

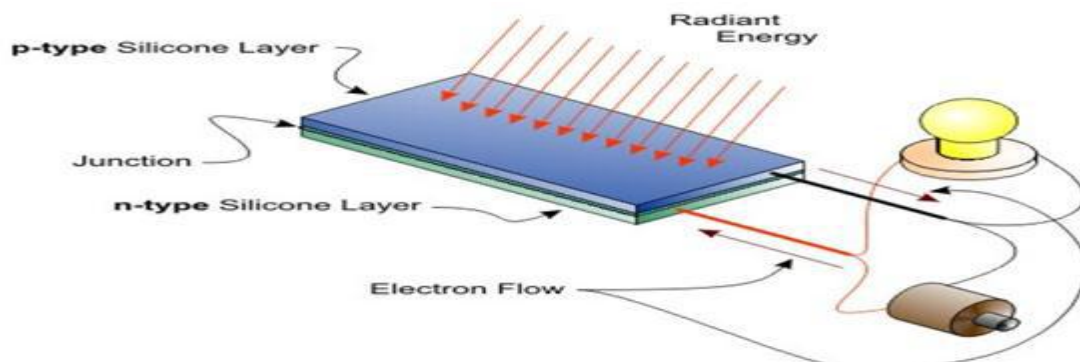


Figure6. Photovoltaic Sensor

Above fig. show PV sensor, this is made up from silicon material (Polycrystalline). Photovoltaic sensor used to convert the radiant energy directly into electrical energy. It is noiseless and pollution free.

RELAY:**Figure7. Relay**

Relay acts as a switch which is used to control the AC/DC supply. This relay can be used to turn ON the electrical appliances like Mobile, fan, tubes etc.

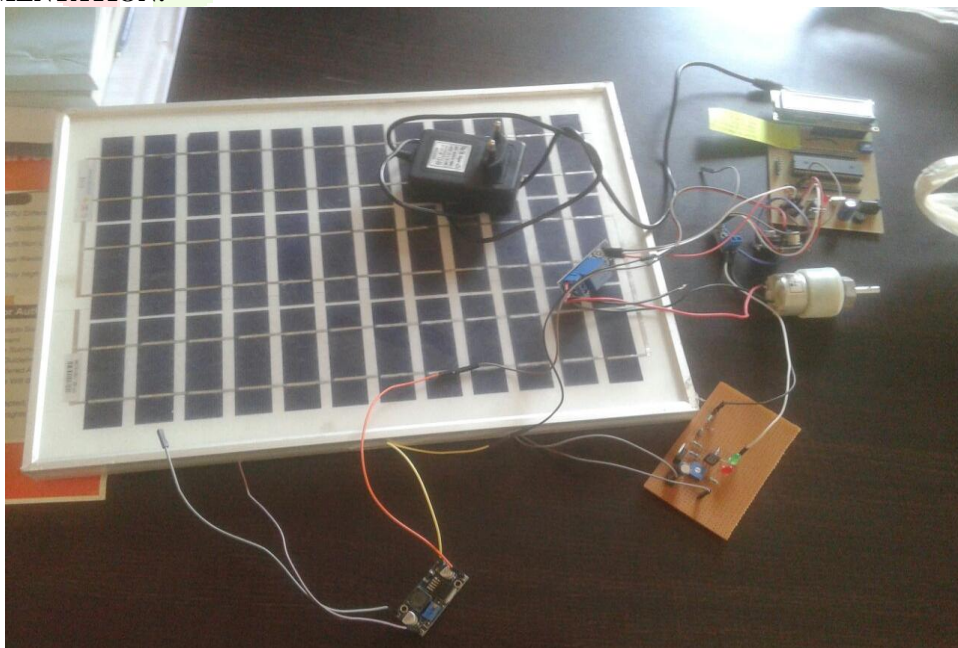
MICROCONTROLLER PIC16F877A:

Microcontroller features:-

- Operating Frequency DC – 20 MHz
- Resets (and Delays) -POR, BOR,(PWRT, OST)
- Flash Program Memory(14-bit words)-8K
- Data Memory (bytes)- 368
- EEPROM Data Memory (bytes)- 256
- Interrupts- 15
- I/O Ports- Ports A, B, C, D, E
- Timers-3
- Capture/Compare/PWM modules- 2
- Serial Communications - MSSP, USART
- Parallel Communications - PSP
- 10-bit Analog-to- Digital Module channels - 8 input channels
- Analog Comparators = 2
- Instruction Set - 35 Instructions
- Packages 28-pin PDIP-40- pin , PDIP44-pin, PLCC,44-pin, TQFP44-pin QFN

BOOST CONVERTER:

A boost converter (step-up converter) is a DC-to-DC power converter that steps up voltage from its input to its output. It is a class of SMPS containing at least two semiconductors and at least one energy storage element: a capacitor, inductor or in combination.

V. DESIGN& IMPLEMENTATION:**Figure 8. Hardware setup of proposed system**

As figure shows, there are two inputs PV sensor and Piezo electric sensor. This uses the solar radiation and sound energy respectively to generate electricity. This generated supply is given to the microcontroller through constant voltage regulator as per requirement and excessive supply is stored in battery. In absence of inputs, battery provides supply to microcontroller through regulator IC7805. As per requirement of load voltage is step up or step down by using buck boost converter. Relay is used as switch for drive the DC load .Relay is drive with the help of relay driver circuit. The LCD is connected with the microcontroller to display which input is used either sound or solar. Result is given below,

SOUND(dB)	VOLTAGE(V)
50	2.7
70	3.5
80	4.7
110	6.2

Table 1. Sound equivalent voltage reading of proposed work

Table.1 shows that when sound input is increased then voltage output is also increased.

VI. 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. The second point and the important one is the sound energy is a mechanical form of energy therefore according to law thermodynamics mechanical energy could be converted into electric energy. Specifically, during conversion numerous processes are not involved and procedures convert the noise to electricity conversion.

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