GENERATION OF POWER USING PIEZOELECTRIC AND HEAT SENSORS

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Abstract

Nowadays energy and power are the one of the basic necessities regarding this modern world. As the demand of energy is increasing day by day, so the ultimate solution to deal with these sorts of problems is just to implement the renewable sources of energy. The objective of this work is power generation through footsteps as a source of renewable energy that we can obtained while walking on to the certain arrangements like footpaths, stairs ,platforms and these systems can be install elsewhere specially in the dense populated areas. We can implement this foot step power generation system by generating the additional power by the heat it can be obtained by the load using the peltier effect. As a result of completing the above procedure we made ourselves able to design such compatible system through which we could run our home appliances through AC output.

Index terms: Power generation, Footstep, Thermoelectric effect, Piezo-electric effect, Display, Efficiency.

1. INTRODUCTION

Energy harvesting also known as power harvesting or energy scavenging is the process by which energy is derived from external sources e.g. solar power, thermal energy, wind energy, salinity gradients and kinetic energy, captured, and stored for small, wireless autonomous devices, like those used in wearable electronics Energy harvesters provide a very small amount of power for low energy electronics.

While the input fuel to some large scale generation costs money (oil, coal, etc.), the energy source for energy harvesters is present as ambient background and is free. For example, temperature gradients exist from the operation of a combustion engine and in urban areas; there is a large amount of electromagnetic energy in the environment because of radio and television broadcasting. Over the past two decades, there has been significant interest in converting mechanical energy from human motion into electrical energy. This electrical energy can then be used to Recharge batteries in electronic devices or directly power small scale, Low-power circuits. A number of commercial devices use human power to produce Electricity such as hand-crank generators (for powering Flashlights, radios, and recharging mobile devices) electrical devices typically generating between 100 and1000W and can be as high as 1000 W).

However, these generators require concentrated human Effort for long periods of time, which might preclude the user from doing other tasks. It is desirable to scavenge or harvest Energy from human movement, while the user is performing His/her everyday activities. This power generation increases power efficiency in our day to day life for low power electronic circuits. We included six chapters first chapter contain introduction, second chapter is about piezoelectric transducer, third chapter is about peltier sensor, fourth chapter is about schematic diagram, fifth chapter is about description of project ,sixth chapter is about conclusion .

II. PIEZOELECRIC TRANSDUCER

A piezoelectric plate is a device that uses the piezo-electric effect to measure pressure, acceleration, strain or force by converting them to an electrical charge. Piezoelectricity, also called the piezoelectric effect, is the ability of certain materials to generate an AC (alternating current) voltage when subjected to mechanical stress or vibration, or to vibrate when subjected to an AC voltage, or both. The most common piezoelectric material is quartz. Certain ceramics, Rochelle

salts, and various other solids also exhibit this effect. When a sound wave strikes one or both of the plates, the plates vibrate. The crystal picks up this vibration, which it translates into a weak AC voltage. Therefore, an AC voltage arises between the two metal plates, with a waveform similar to that of the sound waves.

Figure 1: Piezoelectric Sensor

III. PELTIER SENSOR

In addition to the piezoelectric sensor we use the peltier sensor. A thermocouple consists of two conductors of different metal alloys that produce a voltage in the vicinity of the point where the two conductors are in contact. Commercial thermocouples are inexpensive, interchangeable, are supplied with standard connectors, and can measure a wide range of temperatures.

In contrast to most other methods of temperature measurement, thermocouples are self-powered and require no external form of excitation. The main limitation with thermocouples is accuracy; Thermocouples for practical measurement of temperature are junctions of specific alloys which have a predictable and repeatable relationship between temperature and voltage. Properties such as resistance to corrosion may also be important when choosing a type of thermo couple. Where the measurement point is far from the measuring instrument, the intermediate connection can be made by extension wires which are less costly than the materials used to make the sensor. Thermocouples are usually standardized against a reference temperature of 0 degrees Celsius.

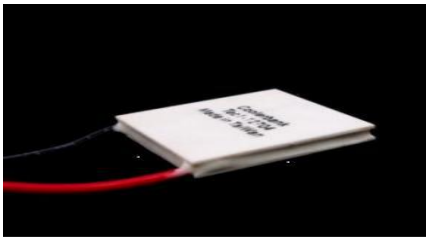

Figure 2: Peltier sensor

IV. SCHEMATIC DIAGRAM

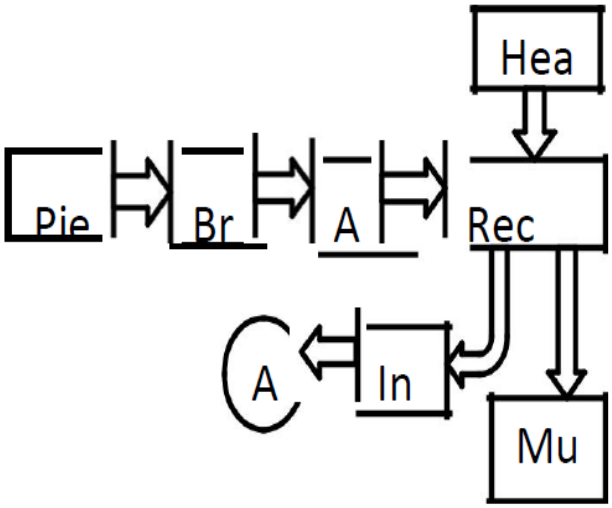

Figure 3: Schematic diagram V.Description of the project

The source of pressure can be either from the weight of the moving vehicles or from the weight of the people walking over it. The piezoelectric material converts the pressure applied into electrical energy by piezoelectric effect. The energy also produced by heat energy using the peltier sensor at load. The output of the piezoelectric material is not a steady one. So a bridge circuit is used to convert this variable voltage into a linear one. Again an AC ripple filter is used to filter out any further fluctuations in the output. The output of dc voltage is then stored in are chargeable battery. An inverter is connected to battery to provide provision to connect AC load. The voltage produced across the tile can be seen in a LCD. For this purpose microcontrollerAT89S52 is used.

A: Bridge Circuit:

The output from the transformer is fed to the rectifier. It converts A.C. into pulsating D.C. The rectifier may be a half wave or a full wave rectifier. In this project, a bridge rectifier is used because of its merits like good stability and full wave rectification. The Bridge rectifier is a circuit, which converts an ac voltage to dc voltage using both half cycles of the input ac voltage. The Bridge rectifier circuit is shown in the figure.

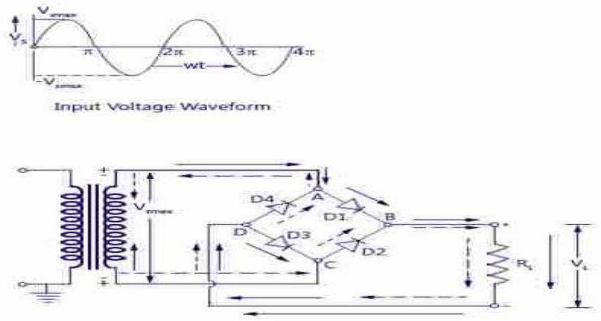

Figure 4: Full wave Bridge rectifier Circuit Diagram

The circuit has four diodes connected to form a bridge. The ac input voltage is applied to the diagonally opposite ends of the bridge. The load resistance is connected between the other tends of the bridge.

For the positive half cycle of the input ac voltage, diodes D1 and D3 conduct, whereas diodes D2 and D4remain in the OFF state. The conducting diodes will be in series with the load resistance RL and hence the load current flows through RL.

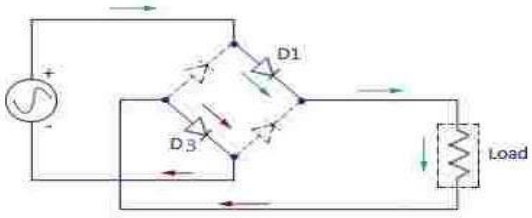

Figure 5: Positive half cycle of bridge circuit

For the negative half cycle of the input ac voltage, diodes D2 and D4 conduct whereas, D1 and D3 remain OFF. The conducting diodes D2 and D4 will be in series with the load resistance RL and hence the current flows through RL in the same direction as in the previous half cycle. Thus a bidirectional wave is converted into a unidirectional wave.

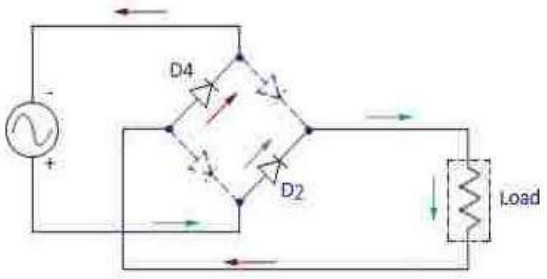

Figure 6: Negative half cycle of bridge circuit

B: AC Ripple Filter:

An AC ripple filter is used to filter out this output voltage and it is stored in rechargeable battery.

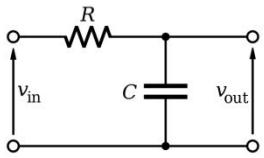

Figure 7: AC Ripple filter

C: Rechargeable 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 centers.

Lead-acid batteries are the most common in PV systems because their initial cost is lower and because they are readily available nearly everywhere in the world. There are many different sizes and designs of lead-acid batteries, but the most important designation is that they are deep cycle batteries. Lead-acid batteries are available in both wet-cell (requires maintenance) and sealed no-maintenance versions. Lead acid batteries are reliable and cost effective with an exceptionally long life. The Lead acid batteries have high reliability because of their ability to withstand overcharge, over discharge vibration and shock. The use of special sealing techniques ensures that our batteries are leak proof and non-spoilable. The batteries have exceptional charge acceptance, large electrolyte volume and low self-discharge, which make them ideal as zero-maintenance batteries lead acid batteries Are manufactured/ tested using CAD (Computer Aided Design). These batteries are used in Inverter & UPS Systems and have the proven ability to perform under extreme conditions. The batteries have electrolyte volume, use PE Separators and are sealed in sturdy containers, which give them excellent protection against leakage and corrosion.

Figure 8: Lead acid battery

D: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 was "inverted", to convert DC to AC. The inverter performs the opposite function of a rectifier.Applications are used in emergency for power failure situation. And used for agricultural, home applications, street lighting, road-highways. Advantages are reliable, Eco-friendly, less maintenance cost. And also reduction in wastage of power.

VI. CONCLUSION

The project "Power Generation Using Piezoelectric Sensor and Heat Sensor Using Microcontroller" is successfully tested and implemented. It provides the affordable solution for energy crisis problem. India is the developing country where energy management is big challenge for huge population. By using this project we can derive both A.C and D.C drive according to force we applied. The electricity is produced from the mechanical stress on the crystals due to piezoelectric effect and thus it generates the energy needed for charging battery to light streetlights at night and also for the city consumption of electricity. This method of power generation is eco friendly and green to environment.

VII. REFERENCES

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