Power Generation using Hybrid Energy System for Domestic Purpose

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ABSTRACT: We all are aware that the world is precisely running towards a quest for a substitute energy source. Till today, the maximum power requirement is met with the help of fossil fuels. Anyways the estimates which were made recently have predicted that the usage of the fossil fuels like oil and coal might last only till 2030, and later we will have to switch over to the usage of more efficient sources and emerging technologies. According to current situation the further usage of oil and coal will be replenished and whole world will need to foster for renewable energy source which can satisfy the growing needs of the future generation. For the past few years solar and wind energy have already been trapped and are widely accepted as an alternative source of energy. But in this paper we have planned to concatenate the three outcomes i.e. heat, pressure and sound. Most of the times these three energies are considered as unwanted source of energy and they go unnoticed. With the help of Peltier module, Piezoelectric transducer and sound absorption unit the energies like heat, pressure and noise can be converted into electrical energy respectively. Piezoelectric plate transducer is capable of producing energy using the pressure put on the piezoelectric plate. In this paper a footstep piezoelectric plate is used easy to incorporate and even effect cost wise. Peltier module is a thermoelectric device which has the capability of converting the thermal/heat energy into electricity. It primarily works based on the principle of Seebeck effect. This device is built using 2 different semiconductor material like p-type and n-type. As the heat emerges and spreads through the material, charge carriers begin to cold side from hot side. The resultant voltage is proportional to the difference in temperature between the layers of the device. As long as there is a difference in temperature the material keeps generating the potential difference. The voltage produced by the entire Peltier module is function of time and the temperature difference. The voltage varies with the change in temperature gradient and time. The sound absorption unit uses sound as an input for producing electric energy, because lot of sound is wasted in our surrounding where in it can used as a source of energy. By using these non-conventional type of energy resources, the generation of power can be achieved with a minimal cost and it will also pave a way to the conservation of the conventional energy source for future needs. This energy thus generated is boosted and stabilized using a DC-DC chopper and later utilized to operate a DC load.

1. Introduction
Responsible utilization of energy resources is the need of the hour. It is highly essential to prefer which source of energy should be used. The considerations like efficiency, cost, stability and cleanliness must be taken into account. It is a bitter fact that nowadays most of the industries are utilizing fossil fuel for power generation. Although the usage of fossil fuel is effective but on a long run they turn into disadvantage. So it is necessary to opt for an alternative energy source. We have planned to use the energies like heat, pressure and sound to generate electricity. In the surrounding there are various sources of sound which are not noticed. Maximum of them is the noise that is produced in industries, public area, etc. An alternative energy source has become the need of the hour in order to meet the rapidly increasing power requirement. The renewable sources of energy such as wind energy and solar energy have been tapped and incorporated as a hybrid system and it has been widely implemented as an alternative for fossil fuels. The sound energy is one of the abundant sources of energy. This energy which is ignored can be recycled and converted into electricity source. The heat energy harvested from different heat sources has the capability to generate different amount of voltages. The pressure or the vibration that is applied to the transducer can...
be converted into Electricity. The electricity which is generated from these three sources is trapped and is boosted. This stored electricity is used to operate electric loads.

2. Literature Survey
Random sound energy can be changed over into electrical energy utilizing piezoelectric transducer. The created electric energy capacitors is enhanced through circuits like voltage multiplier. Sound energy can be detected using different sorts of sound sensors. Here we are fundamentally focusing on creating the electric power for our electronic contraptions from sound energy. We have dissected the work done by various authors in this field and added our work to it.[1] entitled that a moderately less investigated wellspring of environmentally friendly power energy is suggested. Arbitrary sound which is found around is considered as wellspring. A viable method for delivering usable electric power from accessible irregular sound energy is displayed here. Piezoelectric transducers are utilized for transformation of sound energy to electric energy. Here, the created electrical energy from different piezoelectric transducers is put away in various super capacitors which are later processed and enhanced. The final electric power generated is used to charge a battery-powered DC battery for storing purpose. A little 9 volt DC battery was observed to be completely energized inside thirty minutes from completely released stage utilizing medium sound source through the proposed transformation unit. [2] Enumerate the work done on the change systems and philosophies of changing over sound energy to its electrical partner. It centers around the attainability and the ground zero use of the equivalent. The forecast of things to come advancement of these sorts of wellsprings of energy is underscored other than generally referred to ones, for example, sun based energy, biogas, wind energy, etc. So one can suppose we had the option to change over the sound energy to power then we can charge our cell phone just by conversing with our companions on portable itself.

3. Proposed System
There are various sources of sound that are not noticed. Maximum sound is produced from industries, public area, etc,. The piezoelectric transducer converts sound waves created due to noise pollution into energy. Hence it is demonstrated that sound energy can be considered as an alternative energy source. The key element Peltier module has the capability to convert heat energy to electrical energy. The peltier module is constructed using 2 different semiconducting materials like p-type and n-type. It works according to the concept of Seebeck effect, where electricity is generated using the temperature difference around it. Piezoelectric material in general has the capability of producing an electric energy using the pressure applied on it. Whenever a piezoelectric substance is made to experience a mechanical pressure, the electric charges begin to displace which results in voltage generation. Piezoelectric Sensor works based on the piezoelectric effect where all the pressure or mechanical energy that is being applied on it is converted into electric energy signals.

4. Block Diagram
In our proposed system, the power generation from two sources like sound and heat in which in the domestic appliances were planned to operate with the power generated from it. The figure shows the various block in which our proposed system was implemented for energy generation from various sources.
Figure 2 Block Diagram

4.1 Thermoelectric Transducer:
The thermoelectric peltier generator creates a temperature differential on each side. One side of the module becomes hot and the other side remains cold. This works according to the principle of Seebeck effect. The heat/thermal energy is converted into potential difference. This voltage that is generated drives the electric current and produces useful power at the load. This thermoelectric transducer has many applications in refrigeration, heating, cooling, thermal management, etc.

4.2 Piezoelectric Transducer
The piezoelectric transducer is capable of converting the pressure/force applied on it to electrical energy. Here the source of force can be weight of a person stepping over the foot step piezo plate, or weight of a vehicle. The electric energy developed is not constant. Piezoelectric transducers are always employed in measuring shock, vibrations, touch and flex motions.
4.3 Arduino UNO
It is developed by Arduino.cc. The word “Uno” refers to one. This board accommodate with set of digital input and output pins, that will be interface to numerous enlargement board and different circuit. It’s hopped up by external nine potential battery or by USB cable. It is the kind of Arduino Nano. The primary series of Uno board is Arduino Uno. While the Uno communicates the first STK500 protocol, it is completely different from all preceding boards that doesn’t used the FTDI USB to operate on serial driver chip. Meanwhile it use the AT Mega16U2 operated as USB to serial device.

4.4 LCD Display
It is a flat panel display, in which liquid crystal used in its primary operation. LEDs are used in large number for consumers and businesses, which is commonly found in smart phone, television, computer monitor, and instrumental panels. The two necessary liquid phases are nematic and smectic. In which the crystal is in nematic phases, the liquid crystals are like a liquid, their molecule mix past one another and can move around, but they all point in the same path. They are bit like a matchbox, even though you shake them or move them but they always keep pointing the same way. If we cool liquid crystals, the shift over to smectic phase. All the molecules flow into layer that slide past one another easily. The molecules present in the layers can flow within it, but they are able to move or flow in other layers.

4.5 Peltier module
It is a thermoelectric device which works based on a Seebeck effect, which converts the temperature difference (thermal energy) to electrical energy. The peltier module operates like a heat engine. Thermoelectric material generates electricity directly from the heat by transforming the thermal temperature difference to potential difference. The peltier device has a high electrical conductivity (σ) and low thermal conductivity (κ). Whenever the thermal conductivity is low, even one side becomes hot, the other side remains cold. Hence large voltage is generated when there exists a temperature gradient.

4.6 DC-DC booster
A DC-DC device is a mechanical device that converts electrical energy from one voltage level to other. It is an electrical power device. Power level varies from very low to an extreme high. DC-DC Converter area unit utilize in transportable electronic device like cellular device, computers and laptop that area unit furnished power from primarily batteries. Some exception embrace, high efficiency, light emitting diode power source, that area unit a sort of Dc-Dc device that regulates the present through the LEDs and straight forward charge pumps that double or triple the output voltage, it maximize the energy for electrical phenomenon and for wind turbines area unit known as power optimizer.

4.7 Sound Absorption Unit
Sound absorption unit is the live the quantity of energy off from the wave because the wave passes through the given thickness of fabric. Sound absorption means to the method by that a cloth, structure absorbs the sound energy once sound wave are unit encountered once. The energy re-worked into heat. Once sound from loud speaker system collides with the wall of a spaces, there’s is a mirrored image of the sound energy, where a portion of it is distributed into the air as pressure differential, the sound energy travels from fabrics. Deformation leads to mechanical losses by the conversion of portion of the sound into heat energy. Size and form determines the sound wave’s behavior when it moves with it’s wave length, which leads to wave phenomenon and optical phenomenon.

4.8 Power Supply
The board which we are using were operated with an external power supply from 6 V to 20 V. If it supplied with an input less than 7V, then the 5V pin may supply less than 5V, because of which the
board may be inclined to unstable and also if using more than 12V, the voltage regulator may get overheated and board may get damaged. Hence the optimal operating range is from 7 volts to 12 volts.

The board which we are using can be operated with an external power supply from 6 Volts to 20 Volts. If the supply is less than 7 Volts, then 5V pin can supply less than 5V, because of which the board might become unsteady and if it uses more than 12V, it might lead to the overheating of the voltage regulator and damage the board. So the ideal operating distance is from 7V to 12V.

5. EXPERIMENTAL ANALYSIS

This hybrid system converts the three sources such as sound, heat and pressure into electrical energy. The piezoelectric transducer converts the mechanical stress/pressure that is being applied on it into electricity. Using the peltier module the heat energy in the surrounding can be converted into electrical energy. The sound absorption unit generates electricity by absorbing the sound energy from the surrounding. The electricity thus generated is stepped up using a DC-DC booster. This energy is being stored in the battery for future purposes. This energy is used to power the DC load.

Figure 2. DC-DC booster

6. FUTURE WORKS

In further to the proposed work of power generation from various hybrid energy sources, the additional power generation from foot step using piezoelectric and other source of generation can be added together and form a Nano grid i.e. power generation using the small sources for house/small applications.

7. CONCLUSION

As this model consists of three sources, even if one of the sources fails there will be a continuous power supply. Does not require any outside power supply. Can store control in a battery. Depending upon the generation it can charge the portable. Waste sound energy, heat and pressure are thus utilized effectively. Hence it is effectively convenient. Low maintenance and low control utilization.

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