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RENEWABLE POWER GENERATION BY USING MPPT SOLAR PV-SOUND HYBRID SYSTEM

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Abstract *-- It is 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 generate electricity. Nowadays maximum power generation is the need of the world due the fast increment in private, business and mechanical buyers of power all through the world. Sustainable power sources for example energy produced from sun light, wind, biomass, hydro control, geothermal what's more, sea assets are considered as a mechanical alternative for creating clean energy.*

This paper demonstrates the MPPT Solar-Sound hybrid system that generate the sustainable power from Sunlight and noise to deliver electric power. Photovoltaic cells can be utilized to gather the beams of sunlight and after that to change them into power while piezoelectric sensor convert the mechanical energy of sound into electrical energy. System control depends basically on control panel which contains microcontroller. It ensures the perfect use of advantages and accordingly upgrade the profitability as differentiated and their individual strategy for age. Likewise it builds the dependability and decreases the reliance on one single source. This half and half sun oriented sound power generating system is reasonable for businesses and furthermore residential regions due to generation of efficient power.

Keywords: *Piezoelectric sensor, Smart solar system, Microcontroller, Hybrid power system*

INTRODUCTION AND BACKGROUND

We as a whole realize that the world is confronting a noteworthy danger of quick consumption of the petroleum derivative stores. The greater part of the present energy request is met by fossil and atomic power plants. A little part is met by sustainable power source advancements, for example, sun based, the wind, biomass, geothermal and so forth. There will before long be the point at which we will confront an extreme fuel deficiency. A large portion of the examination currently is about how to monitor the energy and how to use the energy efficiently. Research has likewise been into the improvement of solid and hearty systems to tackle energy from nonconventional energy assets. Among them, the sunlight based and sound power sources can be effectively used to create inexhaustible measure of electrical energy. Both are without contamination wellsprings of plenteous power.

Sunlight based energy is energy from the Sun. It is sustainable, unlimited and natural contamination free. Sunlight based charged battery systems give control supply to finish day regardless of awful climate. By embracing the suitable innovation for the concerned land area, we can separate a lot of intensity from sun oriented radiations. Increasingly over sun powered energy is required to be the most encouraging interchange wellspring of energy. The worldwide pursuit and the ascent in the expense of traditional non-renewable energy source is making supply-request of power item practically outlandish particularly in some remote zones. Generators which are regularly utilized as an option in contrast to traditional power supply systems are known to be run just amid specific hours of the day, and the expense of filling them is progressively getting to be troublesome on the off chance that they are to be utilized for business purposes.

Sound energy is the more promptly accessible wellspring of energy. Sound as an elective wellspring of energy has a colossal potential that has been left to a great extent undiscovered as we advance further towards utilizing inexhaustible and supportable wellsprings of energy. The formation of energy through sound would thus be able to convert into production of electrical energy by a standout amongst the most promptly accessible type of contamination. Sound waves are a type of mechanical energy. According to the law of thermodynamics, motions of mechanical waves can be changed over into electrical energy [4]. We have utilized the rule of electromagnetic enlistment, utilizing transducers to change over mechanical into electrical energy. The age of clamor contamination, frightful however it might be, is generally unavoidable much of the time. Along these lines, the creation of energy from this accessible sound source can end up being valuable.

As the electricity demand of world will becomes double in 2030 [1], therefor the requirement for an elective wellspring of energy is rising quick. According to the International Energy Agency (IEA) report in 2017, the world's power demand covered by green sources was 25% [12]. There is a developing mindfulness that sustainable power source, for example, photovoltaic system, wind and Sound power have a vital task to carry out so as to spare the circumstance. Half breed control system comprise of a blend of sustainable power source, for example, sun oriented, sound and so on of charge batteries and give capacity to fulfill the energy need, thinking about the neighborhood geology and different subtleties of the spot of establishment. These sorts of systems are not associated with the principle utility network. They are likewise utilized in remain solitary applications and work freely and dependably.

This paper exhibits the MPPT Solar-Sound cross breed Power system that utilizes the sustainable power sources either individually or collectively, for example, Sunlight and Sound energy to create and supply power to a market, industrial facility, air terminal or some other spot contingent upon the need at the site where utilized.

MPPT SOLAR SOUND HYBRID ENERGY SYSTEM

Sun powered Sound mixture power system is the joined power producing arrangement of piezoelectric board (or piezo sensor panel) and MPPT solar panel.
It likewise incorporates a battery which is utilized to store the energy produced from both the sources. Utilizing this system control age from piezoelectric board when sound source is accessible and age from PV module when light radiation is accessible can be accomplished. The two units can be created power when the two sources are accessible. By giving the battery continuous power supply is conceivable when the two sources are inactive.

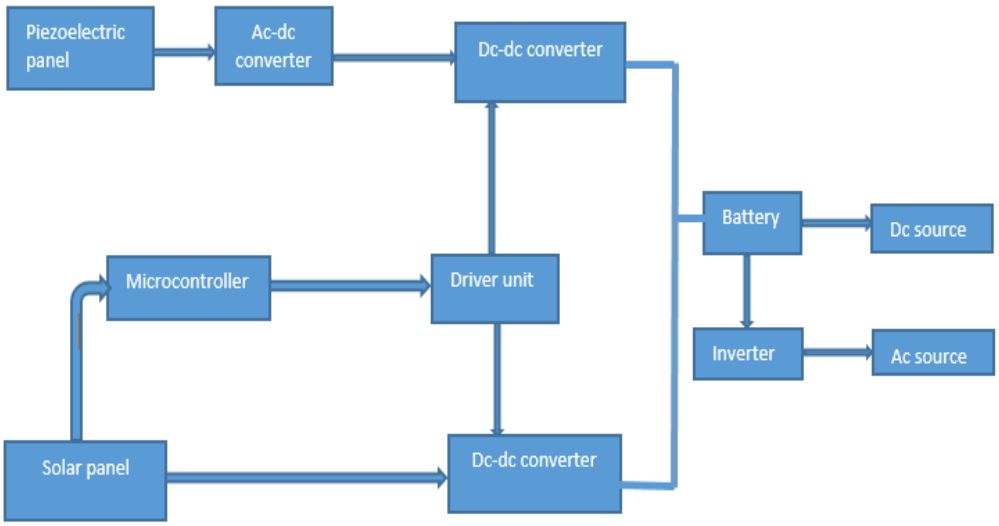

Fig.1: Block Diagram of Solar PV-Sound hybrid power generation system

Figure 1 demonstrates the useful square graph of half and half sun oriented sound energy system. The power created from piezoelectric board is of AC voltage which is changed over through AC-DC rectifier. An extraordinary sort of converter is utilized to venture up or venture down through MOSFET exchanging called "SEPIC" converter for piezoelectric board. For nearby planetary group cuk converter is utilized for the direction. The miniaturized scale controller fused in this plan, which routinely alludes the activity of sources and switches the relating converters and bolstered into change the battery or to the heap through inverters. The yield of the inverter is associated with the heap and after that the voltage is ventured up by a transformer. The driver circuit is utilized to give the entryway motion for the MOSFET of converters.

SCOPE OF RESEARCH

This kind of systems can be effectively executed at railway stations ,air terminals, motorways, arenas, heavy machinery workshops, playgrounds and other different spots where plentiful measure of sound(or noise) and sunlight is normal. The significance of half and half systems has developed as they seem, by all accounts, to be the correct answer for a spotless and disseminated energy production.

OBJECTIVES OF RESEARCH

This research aims to generate efficient electric power from sunlight and sound energy by using an MPPT solar PV-sound hybrid system. To get most efficient hybrid power generation from sunlight and mechanical vibrations, this sort of frameworks ought to be introduced in occupied group places, for example, sports center/club, bus stations, air ports, shopping centers, transport stops and occupied pathways, speed breaker, roadway.

METHODOLOGY OF THE PROPOSED SYSTEM

Irregular energy assets and energy assets unbalance are the most essential motivation to introduce a cross breed energy supply system. The Solar PV wind half breed system suits to conditions where sunlight has occasional shifts and sound energy is additionally irregular. As the enough stable energy may not be accessible for the duration of the day and the sun

does not sparkle for the whole day, so utilizing a solitary source won't be an appropriate decision for producing power. A half and half course of action of consolidating the power saddled from both the sun and the sound source and put away in a battery can be a significantly more solid and practical power source. The heap can in any case be fueled utilizing the put away energy in the batteries notwithstanding when there is no sun or sound energy. Half and half systems are generally worked for plan of systems with most reduced conceivable expense and furthermore with greatest dependability. The staggering expense of sunlight based PV cells makes it less skillful for bigger limit plans and furthermore the piezoelectric sensors have. Battery system is expected to store sun powered and wind energy delivered amid the day time. Amid evening time, the nearness of wind is an additional preferred standpoint, which expands the unwavering quality of the system.
In the rainstorm seasons, the impact of sun is less at the site and in this manner it is able to utilize a half and half wind close planetary system. The framework parts are as per the following:

I. Solar Photovoltaic Panel:

Photovoltaic (PV) is a technique for producing electrical energy by changing over sun powered radiation into direct current. Photo-voltaic cells are made up from semiconductor. In this technique those semiconductors are used which have photovoltaic effect. Sun beams are caught up with this material and electrons are produced from the atoms. This discharge actuates a current. The photovoltaic cell exhibit or board comprises of a proper number of sunlight based cell modules associated in arrangement or parallel dependent on the required current and voltage. Here we used an MPPT solar panel as explained below.

MPPT Photovoltaic Inverter:
The maximum power point tracking (MPPT) solar inverter are the medium to change over sun oriented energy into maximum electrical energy as compare to simple photovoltaic panels. As the MPPT photovoltaic panel and simple photovoltaic panel are made up same materials. But the MPPT panels rotates automatically with light in such a way that maximum light falls on the panel which results 35%-60% increase in efficiency compared the mounted solar panel system[2].
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II. Piezoelectric Sensor:

A piezoelectric sensor is a gadget that utilizes the piezoelectric impact, to quantify changes in pressure, increasing speed, temperature, strain, or force by changing over them to an electrical charge. These sensors change over the mechanical energy into electric charge and gives AC at yield.
Piezo knock sensor creates voltage corresponding to the measure of pressure, for example, vibration or knock applied to piezoelectric crystal. It is utilized to recognize knocks and henceforth it is likewise called as a piezo knock sensor. Crystalline materials produce little measures of electricity when a force is applied that changes their shape here and there. At the point when little measures of pressures are connected to a quartz crystal, a little voltage is delivered from the changing charge made by the moving electrons. Thus we use Piezo sensor panel which is composed of a large number of piezoelectric sensor, as explained below.

Piezo Sensor Panel:
The piezo sensor panel consist of a number of piezoelectric sensors associated in arrangement or parallel dependent on the required current and voltage which converts mechanical energy of sound or noise into electrical energy. The piezoelectric panel is supposed to be designed in cylindrical shape and the sensors are mounted on the panel in such arrangement that most of the sensor gets enough sound energy and gave maximum output. As all the sensors are mounted around the whole panel, thus maximum of sound energy is trapped. Later on this sound energy is converted into electrical energy by these sensors which operate on the principle of piezoelectric effect.

III. Control Panel:

The basic component of control panel is microcontroller which execute program to control a particular operation in a system. The microcontroller analyzes the contribution of both Power system and gives the flag to the specific transfer and charges the DC Battery. The DC voltage is changed over into AC Supply by Inverter Circuit. The MOSFET (IRF 540) is associated with the Secondary of the inside tapped transformer. By activating of MOSFET then again, the present stream in the Primary winding is additionally elective in nature and we get the AC supply in the essential twisting of the transformer.

IV. Battery:

The batteries in the system give to store the power that is created from the noise or the sun oriented power. Any required limit can be gotten by sequential or parallel associations of the batteries. The battery that gives the most profitable activity in the sunlight based and wind control systems are without upkeep dry sort and uses the exceptional electrolytes. These batteries give an ideal execution to long discharges. On the basis of lifespan and charge storing lithium ion batteries are best but lithium ion batteries have high costs. However we can also use other batteries like salt water and lead acid battery.

V. Inverter:

Energy put away in the battery is drawn by electrical stacks through the inverter, which changes over DC control into AC control. The inverter has in-manufactured insurance for Short-Circuit, Reverse Polarity, Low Battery Voltage and Over Load. Thus we can both Ac and Dc power by just plugging the relevant source.

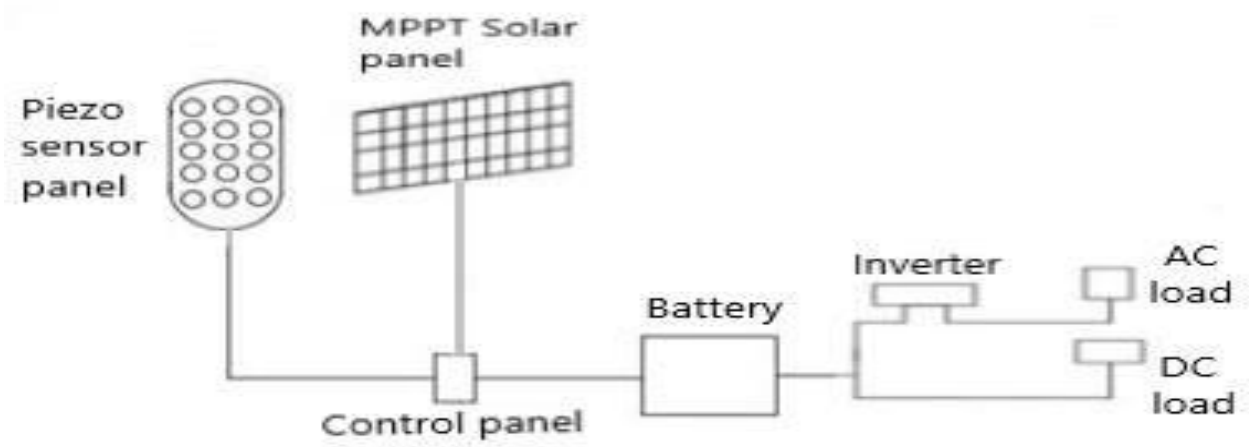

Fig. 2: Renewable Power Generation by using MPPT Solar PV-Sound Hybrid System

Contingent depend upon the natural conditions, required energy for the system can be provided either independently from the noise or sunlight or utilizing these two assets in the meantime is appeared in figure 2.

RESULTS

1. The efficiency of solar panel in the proposed system is increased up to (35%-60%) by using MPPT solar inverter system which becomes a huge difference in large solar grid stations.
2. The piezoelectric panel will capture 3 times the maximum amount of mechanical vibrations from environment as the piezoelectric sensors are mounted on the panel of cylindrical shape, so there will be maximum probability of getting mechanical vibrations from every side of the panel.
3. The overall efficiency of the power system is increased up to 25% - 40%.

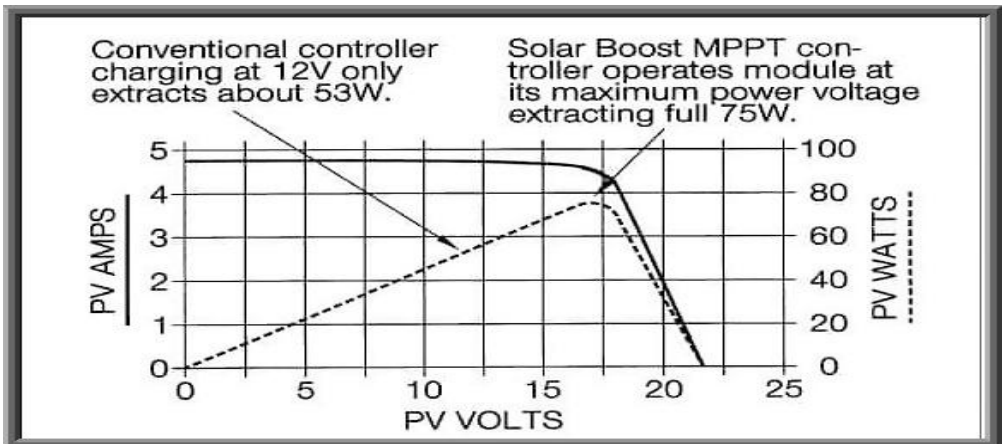

Fig.3: Typical 75W PV module Power/Voltage/Current for Conventional charge controller Verses MPPT charge controller at Standard Condition.

CONCLUSION

In the present work a MPPT Solar PV-Sound Hybrid Energy System was executed. We have researched on the feasibility of applying piezoelectricity for changing over the mechanical vibrations as well as solar energy from sun to generate hybrid power. We have additionally explored the practicability of utilizing MPPT solar concentrators to improve the yield power of the solar panel to a significant dimension. It reduces the dependence on one single source and has extended the faithful quality. From this time forward we could upgrade the viability of the framework as differentiated and their individual technique for age. We hope that it will be very useful to electrify the cities and companies in the future.

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