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Wireless Power Transmission Using ClassC Power Amplifier from Solar Input

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ABSTRACT: The electrical power transmission from the source to destination takes place without any use of wires is known as wirelesspower transmission. Copper cables and conducting wires are eliminated for the wireless transfer of electrical energy. Wireless power transmission (WPT) has a wide range of applications like charging of electric vehicles, Hybrid cars, electronic devices, etc. Earlier transfer of wireless power has been achieved for charged batteries or AC sources. Wireless power transmission has been achieved previously by using an AC supply or through charged batteries. In this project, renewable energy has been used as the source for wireless power transmission. As the output from the renewable energysources is low, we have to use a suitable step-up converter. The DC output voltage from the solar cell is boosted using a high step-upconverter and it is converted to oscillating signals. These oscillating signals are thenamplified by using an amplifier and then fed to the transmitter coil. By operating at the resonant frequency and by achieving good coupling between the transmitter and receiver coil setup, the electrical energy gets transferred from the transmitter coil to the receiver coil due to magnetic resonance between them. The transferred energy is converted back to DC using rectifiers and given to the DC load.

I. INTRODUCTION

The transmission of electrical energy from source to load for a distance without any conducting wire or cables is called Wireless Power Transmission. Wireless power is necessary where the connection of wires is not possible, dangerous, and inconvenient. The principle of operation of wireless powertransmission was established by Nikola Teslain the early 1900s. Nikola Tesla invented a resonant transformer known as the Tesla coil, which was used to transfer power wirelessly using the radiative method. However, the Tesla coil produced a dangerously high voltage electric arc which was a major concern in terms of safety. The popularity of wireless technology hasincreased in recent years and also the interestin magnetic power transmission has re- emerged. In the year 2007, the MIT team wasable to transfer 60 watts wirelessly over a distance of 2 meters with an efficiency of less than 40% using a 60 cm diameter coil. The wireless transfer of power can be achieved in three ways which are magnetic coupling mode, electric field coupling mode, and electromagnetic radiation mode.

The magnetic coupling mode is classified into short-range electromagnetic induction and mid-range strongly coupled magnetic resonance. The power transferred and the transfer efficiency in the case of electromagnetic induction is high but the distance to which the power is transferred is less. In the case of the strongly coupled magnetic resonance method, the power can be transferred for a longer distance with reduced efficiency when compared to the short-range electromagnetic induction type. The main principle in the case of electric fieldcoupling mode is the redistribution of thesurface charge on any object. The transmitter is excited with a highvoltage and high-frequency source togenerate an alternating electric field that couples with the resonant receiver. The power transferred in this mode is less and the efficiency of the power transfer is largely affected by the surrounding medium. Lastly, in the case of electromagnetic radiation, the electric energy is converted intoelectromagnetic energy such as laser beams or microwaves, which can be radiated over alonger distance.

With the increased distance of powertransmission in electromagnetic radiation mode, the transfer efficiency is reduced. Thedc-dc converters are mainly used in switch mode regulated power supply and also in dc motor drive applications. These converters have many practical applications, such as solar-cell energy systems, fuel cell energy conversion

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systems, uninterruptable powersupply systems, etc. The DC-DC converter requires a large boost conversion from the panel's low voltage to the voltage level of theappliance. Some converters increase turn the ratio of the coupled inductor to obtain higher voltage than a conventional boost converter. They are a range of converters combined developed to accomplish high voltage gain by using coupled inductor technique.Combinations of the auxiliary resonant circuit, active snubber synchronous rectifiers, or switched capacitor-based resonant circuits, and so on, these circuits made the active switch into zero voltage switching (ZVS) or zero current switching (ZCS) operation and improved converter efficiency.

II. BLOCK DIAGRAM



Fig.1.Block Diagram

III. WORKING PRINCIPLE

In the proposed technique we implemented a solar-based road cleaning robot to sweep the dust and unwanted waste in the roadways. In the project, design, and development of road cleaner robot which works on both automatic and manual mode. This robot is controlled by an Arduino controller. The multipurpose road cleaning machine has a wide range of applications. It can be used on all kinds of roads in rural as well as urban. Working on the basic principleof science, the project is a collaboration of mechanical, electrical, and electronic devices. To overcome the rising issues of cleanliness in India the multipurpose road cleaner can play a vital role. The cleaner solves the problem of dusty roads, choked pipelines and manholes, removal of metal particles from road and also obstacles. The machine is an assembly of various rigid components, a chassis, some motors, microcontrollers, and various electromechanical devices whose working takes place on the various laws of physics and simple science. In this paper, our motive is to present a detailed qualitative study of cleaning system using the cleaner.

A.PV Module

Usually, several PV modules are arranged in series and parallel to meet the energy requirements. PV modules of different sizes are commercially available (generally sized from 60W to 170W). For example, a typical small-scale desalination plant requires a few thousand watts of power. A PV array consists of several photovoltaic cells in series and parallel connections.



Fig.2. PV Module

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Series connections are responsible for increasing the voltage of the module whereas the parallel connection is responsible for increasing the current in the array the most important component that affects the accuracy of the simulation is the PV cellmodel. Modeling of PV cell involves the stimation of the I-V and P-V characteristicscurves to emulate the real cell under various environmental conditions. An ideal solar cell is modeled by a current source in parallel with a diode. However, no solar cell is ideal, and thereby shunt and series resistances areadded to the model.

Typically a solar cell can be modeledby a current source and an inverted diode connected in parallel to it. It has its series and parallel resistance. Series resistance is due to hindrance in the path of flow of electrons from n to p junction and parallel resistance isdue to the leakage current. When irradiance hits the surface of the solar PV cell, an electrical field is generated inside the cell. Asseen in Fig.3 this process separates positive and negative charge carriers in an absorbing material (joining p-type and n-type). In the presence of an electric field, these charges can produce a current that can be used in an external circuit. This generated current depends on the intensity of the incident radiation. Level of light intensity, the more electrons can be unleashed from thesurface, the more current is generated.

B.LEAD Acid Battery

The lead-acid battery was developed in 1859 by French Physicist Gaston planet and is the most established kind of Rechargeable battery. Despite having a low vitality to weight Proportion and a low vitality to-volume proportion, its capacity to supply high surge streams implies that the Cells have a moderately extensive energy-to- weight Proportion. This element, alongside their minimal effort, makes it appealing for use inengine vehicles to give the High current required via car starter engines. As they are cheap contrasted with more up-to-date advancements, lead-acid batteries are generally utilized notwithstanding when surge current is not vital and different plans could give higher vitality densities. Extensive arrangement lead-acid plans are generally utilized for capacity as a part of reinforcement force supplies in mobile phone towers, high accessibility settings like healing facilities, and stand-alone power frameworks. For these parts, altered variants of the standard cell might be utilized to enhance stockpiling times and lessen support prerequisites. Gel-cells and consumed glass- mat batteries are basic in these parts, all in all, known as VRLA (valve-directed lead-acid) batteries.

Amplifying the life of your SLA battery by utilizing an insightful charger is not just practical, it is likewise better for the earth. Before taking a gander at the distinctive charging strategies it is vital to comprehend the battery science and what happens amid typical charge and release cycles. Normally the positive plates in a SLAbattery are produced using lead dioxide and the negative plates from a wipe lead. The electrolyte is generally sulphuric corrosive blended with a gelling operator and is to a great extent consumed and held by protecting separators between the plates. When an SLA battery is being discharged; the lead (Pb) on the negative plate and the lead dioxide (PbO2) on the positive plate are converted to lead sulfate (PbSO4). At the same time, the sulphuric acid (H2SO4) is converted to water (H2O). In a normal charge, the chemical reaction is reversed. The lead sulfate and water are electro-chemically converted to lead, lead dioxide, and sulphuric acid. During a fullcharge cycle any gasses produced need to be recombined in a so-called 'oxygen cycle'.

Oxygen is generated at the positive plates during the latter stages of the charge cycle, this reacts with and partial discharges in the spongy lead of the negative plates. As charging continues, the oxygen produced also re-combines with the hydrogen being produced on the negative plate forming water. With correct and accurate cell voltage control all gasses produced during the charge cycle will be re-combined completely into the negative plates and returned to the water in the electrolyte.

C.ARDUINO UNO

The microcontroller is a computer ona chip. Micro suggests that the device is small, and the controller tells you that the device' might be used to control objects, processes, or events. Another term to describe a microcontroller is embedded controller, because the microcontroller and its support circuits are often built into, or embedded in, the devices they control. It is a temporary storage unit. Arduino is an open-source microcontroller that can be easily programmed, erased, and reprogrammed at any instant of time. Arduino uses hardware known as Arduino development board and software for developing code known as IDE. The microcontroller board used in our designis Arduino Uno, it is an open-source platform used for building electronic projects, it has both a physical board and has own unique simplified programming language and hasendless possibilities such as we can interfaceseveral sensors, actuators like motors, here we did not require any dumper kit to dump the program into the board Coming to the specification of Arduino Uno microcontroller board, it uses Atmega328p-pu as the main microcontroller, the operating voltage of the board is 5v, the

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recommended input voltage and limit input voltage is 7v12v and 6v-20v.



Fig.3. Arduino UNO

It consists of 14 digital input/output pins, 6 PWM digital input/output pins, and 6 analog input pins, the dc current obtained from input/output pins is 20ma, and from 3.3v pin is 50ma. Building a complete microprocessor system on a single chip substantially reduces the cost of building simple products, which use the microprocessor's power to implement their function because the microprocessor is a natural way to implement many products. It is important to understand that the Arduino board includes a microcontroller, and thismicrocontroller is what executes the instructions in your program.

IV. HARDWARE IMPLEMENTATION



In this project renewable energy has been used as the source for wireless power transmission. As the output from the renewable energy sources is low, we have to use a suitable step-up converter. By operating at resonant frequency and by achieving good coupling between the transmitter and receiver coil setup, the electrical energy gets transferred from transmitter coil to the receiver coil due to magnetic resonance between them.

V. CONCLUSION

This project has introduced the transmission of power wirelessly using the input from the solar panel. The proposed wireless power transmission using a high step-up dc-dc converter for PV cells has been built based on the simulation performed on MATLAB/ SIMULINK. The model uses the input from the solar panel and by using a high step-up dc-dc converter, the input of 12V has been steppedup to 70V which is then given as the input to the class E transmitter. The secondary or thereceiver of the proposed model receives a DCoutput of 110V and the power delivered to theload is nearly 28W.

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