iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** VI **Month of publication:** June 2021

DOI: https://doi.org/10.22214/ijraset.2021.35919

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue VI Jun 2021- Available at www.ijraset.com

Battery Charging from Solar using Buck Converter with MPPT

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Abstract – In this paper we are learn about the Battery charged from solar by using Buck Converter with MPPT. A buck converter is used as dc to dc converter for charge control implementation. MPPT is also used to extract the maximum power from these PV modules. Finally LCD'S are also used to observe the voltage and current ratings of battery that is charged from the output of buck converter. Solar energy which is freely available is used in this process to charge the battery. This process is simple and can be performed easily to charge Battery.
Battery charging from solar using buck converter with MPPT is eco-friendly process and can be used in area with are not electrified. This process is very beneficial to charge the battery.
Keywords — MPPT, Buck Converter, PV array.

I. INTRODUCTION

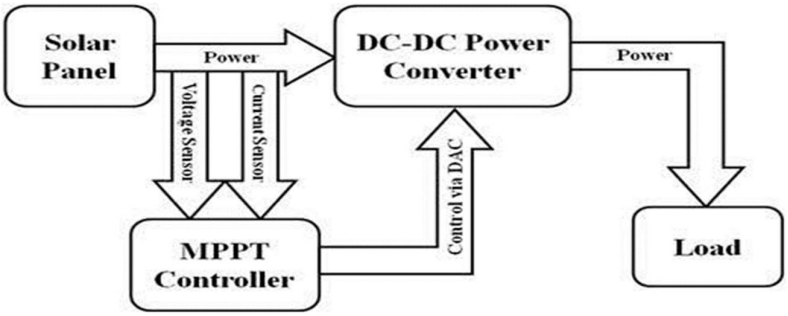
Solar energy is directly produced by sun. The sun creates this energy through thermonuclear process. Due to nature of solar energy, two components are required to have functional solar energy generator. The two components are:
Collector - which collects the radiation that falls on it and convert it into another form of energy
Storage Unit – stores excess energy produced during the period of maximum productivity and releases it when the production drops.

A. Advantages of Solar energy are:
1) Solar energy is a renewable energy source.
2) Solar energy comes in free of charge.
3) Solar energy reduces cost such as electric bills as the solar source is free.

B. Purpose of this Process
1) In some remote areas there is no electricity, by using this system people can use electricity.
2) No pollution is caused by this system, because solar energy is eco-friendly and renewable.
3) It offers lots of benefits.
4) By storing this energy, we will be able to run different electronic devices.
5) There is no noise pollution.

II. BLOCK DIAGRAM

The block diagram of this system contains PV array, buck converter and battery. The PV array is used to convert the solar energy into electrical energy. The principle used is PHOTOELECTRIC EFFECT for conversion of solar energy into electrical energy.
The buck converter comprises of MOSFET switch, inductor, capacitor and diode. This buck converter is used to reduce the input voltage to desirable voltage of charging. Finally the battery is charged by the output of this buck converter.



III. LIST OF CONPONENTS USED

A. PV Array

A Photo voltaic array is collection of photovoltaic module. This each photovoltaic module is made up of multiple number of interconnected PV cells. This PV cells operate through photovoltaic effect, which converts sunlight into electrical energy. This PV cells observes some energy of sun and causes current to flow between the two oppositely charged layers. Individual solar cell provides small amount of power, but this electrical output can be significant when connected together. The PV cells ,modules and array can be connected in series or in parallel to create a desired peak voltage output.



B. Buck Converter

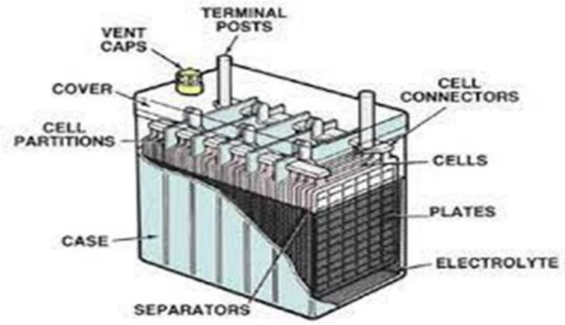
A Buck converter is a DC to DC Power converter. This buck converter steps the voltage from input voltage to its output. Buck converter comprises of MOSFET switch, inductor, capacitor, storage element, diode. To reduce voltage ripple in the system, capacitor filters are added to this converter output and input. This buck converter plays a major role in this system.

C. Lead Acid Battery

Lead acid battery is a type of rechargeable battery and it has low energy density. This lead acid battery has high ability to supply high surge current. These batteries are inexpensive compared to other batteries.

Essential parts in lead acid batteries

1) *Electrolyte:* It is a mixture of water and sulfuric acid. Electrolyte is critical part of lead acid battery. This react with lead plates and caused the current to flow. In low maintenance batteries, the electrolyte level is checked and filled with distilled water. Whereas in maintenance free batteries no need of water service.
2) *Separators:* They are very essential in lead acid batteries. Lead acid batteries keeps the positive and negative plate separate from each other to prevent the battery from short circuiting. They must be chemically compatible with the electrolyte solution and must be resistant to oxidation.



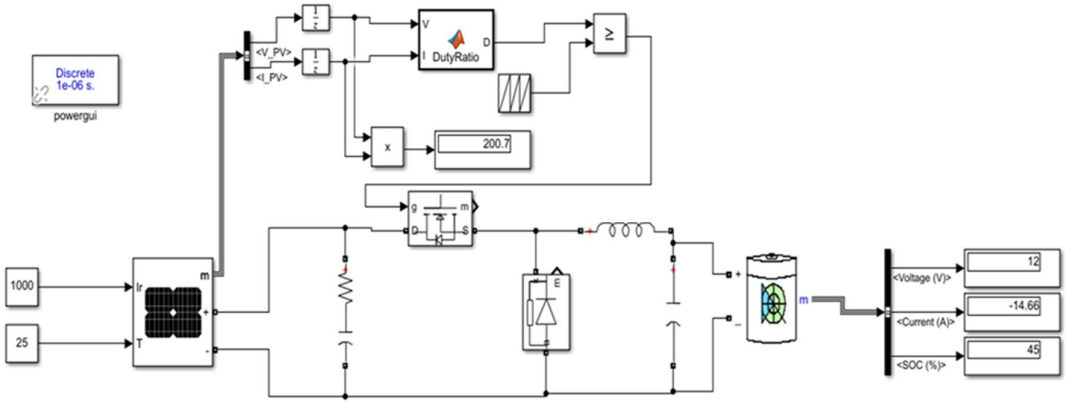
D. MPPT (Maximum Power Point Tracking)

Maximum power point tracking is used in photovoltaic solar system to maximize power extraction under all condition. The main purpose of MPPT is to sample the output of PV cells and apply to the proper load to obtain maximum power for any environment condition.

1) *Working of MPPT:* The major principle of MPPT is to extract the maximum power from this PV module. MPPT checks the PV module and it compare it with the battery voltage then it will fix the best power that PV module produces to charge the battery and it will convert into best voltage to get max current into battery.



IV. CIRCUIT DIAGRAM



V. WORKING OF SYSTEM

PV array is a linked collection of photovoltaic module. Each module is made of inter connected PV cells. These collects the solar energy and convert it to electrical energy. The output from these pv is sent to MMP and buck converter. The MPPT sample the output of PV cell and apply to the proper load. This extracts the maximum power. The buck converter is DC to DC power converter, this steps down voltage from input to its output. To reduce the voltage ripple filters made of capacitors are normally added to such a converter output and input. The output from this buck converter is sent to the batteries. Lead acid battery is used because it is rechargeable battery and it has low energy density, they also have ability to supply high surge current. The battery gets charged from this output of buck converter. The voltage and the current values of batteries are displayed on LCD's.

VI. EXPERIMENTAL RESULTS

The battery gets charged from the output of the buck converter. The current and the voltage values of battery charging can be observed on LCD's that are connected to battery.

VII. CONCLUSION

In this we learnt about the process for charging battery from solar using buck converter with MPPT. This process is quite simple and useful in our daily life. Finally the battery voltage and current values can be known by connecting LCD's to the battery. Then the battery voltage and current values are displayed on these LCD's. After performing this process, we can say that BATTERY CHARGING FROM SOLAR USING BUCK CONVERTER WITH MPPT gives best results.

VIII. ACKNOWLEDGEMENT

We would like to express our sincere thanks to our project supervisor Asst.Prof. N .Ranjith Kumar Department of EEE, Sreenidhi Institute of Science and technology for his constant support, timely help, guidance, sincere co-operation during the entire period of my work. We are greatfull to him of providing all the necessary facilities during the course of project work and for the help provided during various stages of the project.

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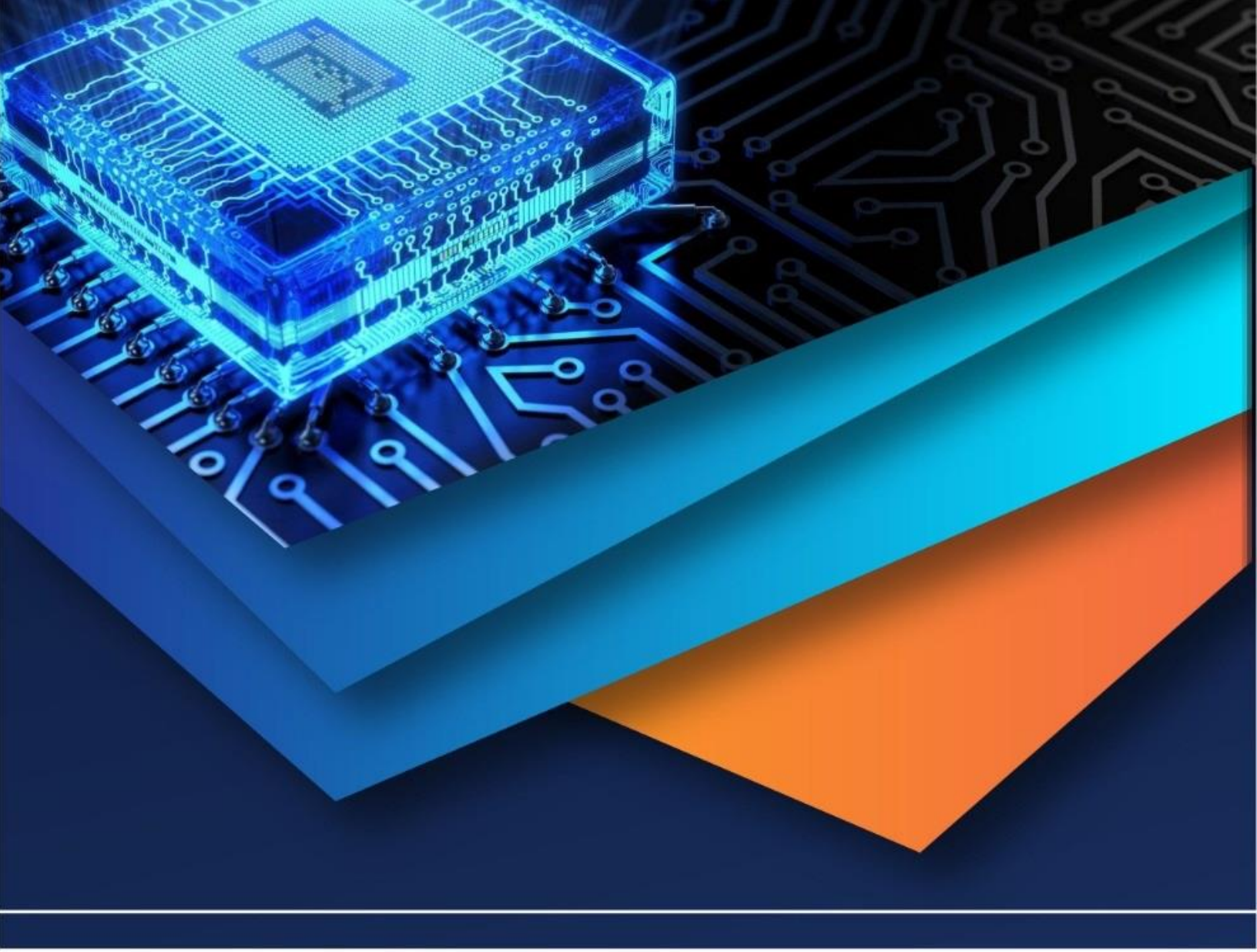
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