© 2018 IJSRSET | Volume 4 | Issue 1 | Print ISSN: 2395-1990 | Online ISSN : 2394-4099
Themed Section : Engineering and Technology

# Survey of Solar Energy Harvesting System for Battery Charging Using Photovoltaic Panel

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**ABSTRACT**

Today, A Solar energy is one of the features that has been used in many application, specially the use of a photovoltaic panel because it provides clean, easy and endless to use energy of the photovoltaic panel. Hence the energy from photovoltaic panel is available for limited time depending on weather & duration of sunlight means enviornmental conditions. This system may lack of reliability if it does not receive the maximum power from photovoltaic panel. This paper proposes to introduce new techniques that utilize solar energy &control the charging of battery at maximum efficiency.

**Keywords:** Photovoltaic panel (PV), reliability, battery charging and efficiency.

## I. INTRODUCTION

Today, a renewable energy is the important features have been used in many more applications, specially the use of photovoltaic panel. Its provides clean easy to use energy of the photovoltaic panel. The energy from photovoltaic panel is limited time, depends on the weather and duration of sunlight or environmental condition. These systems lack the reliability and not receive sufficient power from the photovoltaic panel. This system improves the reliable operation to added to store energy the Sunlight is available.

Hence the battery charging process control is quickly charge battery and the overcharging or the undercharging to prevent from the sunlight. Result is show the decrease the battery from permanent damage and lifetime of the battery .This propose system to represent to solar energy application in harvesting. These systems combine the photovoltaic panel MPPT to develop the process to the battery. And it also the power manage this system. This system will use PIC microcontroller 16F877A with buck boost converter and two batteries.

## II. METHODS AND MATERIAL

### A. Literature Review

In [1] the PV module is the interface which converts light into electricity. Modeling this device, necessarily requires taking weather data (irradiance and temperature) as input variables. The output can be current, voltage, power or other. However, trace the characteristics I(V) or P(V) needs of these three variables. Any change in the entries immediately implies changes in outputs. That is why, it is important to use an accurate model for the PV module. This paper presents a detailed modeling of the effect of irradiance and temperature on the parameters of the PV module.

In [2] the severity of the global energy crisis and environmental pollution, the photovoltaic (PV) system has become one kind of important renewable energy source. Solar energy has the advantages of maximum reserve, inexhaustibleness, and is free from geographical restrictions, thus making PV technology a popular research topic. This study is aimed at developing a PV charging system for Li-ion batteries by integrating Maximum Power Point Tracking (MPPT) and charging control for the battery. In order to enable the solar cell to use the sunlight effectively, a DC/DC boost converter for solar power generation was first designed, which used the MPPT Algorithm of Variable Step Size Incremental Conductance Method (INC) to enable the solar cell to track the MPPT at any time. The output from the DC/DC boost converter then entered the DC/DC buck converter to reduce the voltage for charging purposes. The charging system uses a constant voltage method to charge the Liion battery. The PI controller design Constant Voltage (CV) charging method uses a genetic algorithm to determine the optimal gain value. The numerical simulation showed that the PV charging system proposed by this study is easily realized, and can resist the disturbance of external environmental changes, and achieve fast charging.

In [3] the many different techniques for maximum power point tracking of photovoltaic (PV) arrays are discussed. The techniques are taken from the literature dating back to the earliest methods. It is shown that at least 19 distinct methods have been introduced in the literature, with many variations on implementation. This paper should serve as a convenient reference for future work in PV power generation.

In [4] the power supplied by solar arrays depends upon the isolation, temperature and array voltage, it is necessary to control the operating points to draw the maximuin power of the solar array. The object of this paper is to investigate the maximum power tracking algorithms which were often used to compare the tracking efficiencies for the system operating under different controls. A simple method which combines a discrete time control and a PI compensator is used to track the maximum power points (MPP's) of the solar array. The implementation of the proposed converter system was basecl on a digital signal processor (DSP).The experimental tests were carried out, the tracking efficiencies are confirmed by simulations and experimental results.

In [5] the photovoltaic (PV) stand-alone system requires a battery charger for energy storage. This paper presents the modeling and controller design of the PV charger system implemented with the single-ended primary inductance converter (SEPIC). The designed SEPIC employs the peak-current-mode control with the current command generated from the input PV voltage regulating loop, where the voltage command is determined by both the PV module maximum power point tracking (MPPT) control loop and the battery charging loop. The control objective is to balance the power flow from the PV module to the battery and the load such that the PV power is utilized effectively and the battery is charged with three charging stages. This paper gives a detailed modeling of the SEPIC with the PV module input and peak-current-mode control first. Accordingly, the PV voltage controller, as well as the adaptive MPPT controller, is designed. An 80-W prototype system is built. The effectiveness of the proposed methods is proved with some simulation and experimental results.

**B.Methodology**

The system will consists of two converter and two batteries. The two batteries on battery will act as primary battery and the other one will act as the auxillary battery. The PV panel output will be given to the primary battery through buck/boost converter. If the PV panel output will be low, then the boost converter will get enabled and will increase the voltage then given to the Primary battery. Similarly when the PV panel output is high, buck converter enabled and decrease the voltage then given to the Primary battery.

If excessive voltage is available from PV output then during this duration the buck/boost converter gets activated and supplies voltage to the auxiliary battery

The microcontroller PIC 167F88 will be used to generate the PWM signal to control the buck Converter , the boost converter and the buck-boost converter.The PV panel output will be measured using the DC voltage measurement arrangement and will be forwarded as reference to the microcontroller.

**Boost converter:** A boost converter (step-up converter) is a DC-to-DC power converter that steps up voltage (while stepping down current) from its input (supply) to its output (load). It is a class of switched-mode power supply (SMPS) containing at least two semiconductors (a diode and a transistor) and at least one energy storage element: a capacitor, inductor, or the two in combination. To reduce voltage ripple, filters made of capacitors (sometimes in combination with inductors) are normally added to such a converter's output (load-side filter) and input (supply-side filter).The boost converter is selected and used to track the MPP because it is simple and high efficiency.

**Buck Converter**: A buck converter (step-down converter) is a DC-to-DC power converter which steps down voltage (while stepping up current) from its input (supply) to its output (load). It is a class of switched-mode power supply (SMPS) typically containing at least two semiconductors (a diode and a transistor, although modern buck converters frequently replace the diode with a second transistor used for synchronous rectification) and at least one energy storage element, a capacitor, inductor, or the two in combination. To reduce voltage ripple, filters made of capacitors (sometimes in combination with inductors) are normally added to such a converter's output (load-side filter) and input (supply-side filter). The process of the buck converter will optimize charging voltage.

**Bidirectional Buck/Boost Converter**: The buck–boost converter is a type of DC-to-DC converter that has an output voltage magnitude that is either greater than or less than the input voltage magnitude. It is equivalent to a flyback converter using a single inductor instead of a transformer. Two different topologies are called buck–boost converter. Both of them can produce a range of output voltages, ranging from much larger (in absolute magnitude) than the input voltage, down to almost zero.This circuit allocates and harvests all power from the PV panel and controls the charging process of the primary battery. If the power of the PV panel is higher than the charging power of the primary battery, the bidirectional back/boost converter will be the buck converter to transfer the excess power to the auxiliary battery. However, if the power of the PV panel is lower than the charging of the primary battery, the bidirectional back/boost converter will be the boost converter to transfer the power from the auxiliary battery to the primary battery.

**MPPT Technique**

Maximum power point tracking (MPPT or sometimes just PPT) is a technique used commonly with wind turbines and photovoltaic (PV) solar systems to maximize power extraction under all conditions. Although solar power is mainly covered, the principle applies generally to sources with variable power: for example, optical power transmission and thermo photovoltaics.

PV solar systems exist in many different configurations with regard to their relationship to inverter systems, external grids, battery banks, or other electrical loads. Regardless of the ultimate destination of the solar power, though, the central problem addressed by MPPT is that the efficiency of power transfer from the solar cell depends on both the amount of sunlight falling on the solar panels and the electrical characteristics of the load. As the amount of sunlight varies, the load characteristic that gives the highest power transfer efficiency changes, so that the efficiency of the system is optimized when the load characteristic changes to keep the power transfer at highest efficiency. This load characteristic is called the maximum power point and MPPT is the process of finding this point and keeping the load characteristic there. Electrical circuits can be designed to present arbitrary loads to the photovoltaic cells and then convert the voltage, current, or frequency to suit other devices or systems, and MPPT solves the problem of choosing the best load to be presented to the cells in order to get the most usable power out.

Solar cells have a complex relationship between temperature and total resistance that produces a non-linear output efficiency which can be analyzed based on the I-V curve. It is the purpose of the MPPT system to sample the output of the PV cells and apply the proper resistance (load) to obtain maximum power for any given environmental conditions. MPPT devices are typically integrated into an electric power converter system that provides voltage or current conversion, filtering, and regulation for driving various loads, including power grids, batteries, or motors.

## III. CONCLUSION

This paper proposes to introduce new techniques that utilize solar energy &control the charging of battery at maximum efficiency.

## IV. REFERENCES


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