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Paper on Implementation Of MPPT Charge Controller Based Buck-Boost Converter

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Abstract— *In this project, design of MPPT charge Controller shows as a buck-boost converter. This buck-boost converter is to maintain the constant output voltage as well as abstracts the more additional available power from the photovoltaic module. This system is based on constant voltage trcking method. This system consist of buck-boost converter which is based on TL494 IC.TL494 is fixed frequency, pulse width modulation control circuit. Also it includes ACS 712 current sensor, LCD display, microcontroller, MOSFET circuit, coil burner as a load.*

Key Words- **Photovoltaic module, buck-boost converter method, Burner coil(load),current sensor, Ferrite core transformer.**

INTRODUCTION

Now a day's, most of works are depends on electricity. so, demand of electricity is increased by day to day.But cost of generating power is more. So, for that problem, we find out the solution.We have a solar energy.It is pollution free and sustainable energy.By using this solar energy we have implemented the MPPT charge controller technique. MPPT is a maximum power point tracking charge controller to track the operating point and keep the maximum power point at highest efficicency. PV module is to deliver the available power. MPPT harvested more power from PV module and store into battery.

So,battery charge current will increased and then the system efficiency also improved.By generating the electricity using this technique is more helpful to reduce the power generating cost. From many researches on generation of electricity,we fount that MPPT technique is most efficient and economical to generate electricity. The Microcontroller is used only for displaying the voltage, current and power. A charge controller is used to regulates the charge to battery and avoiding overcharging.

BUCK CONVERTER

It is a DC-DC power converter which steps down the voltage or step up the current from its input to output. Also it is converter which DC input Voltage is greater than DC output voltage.

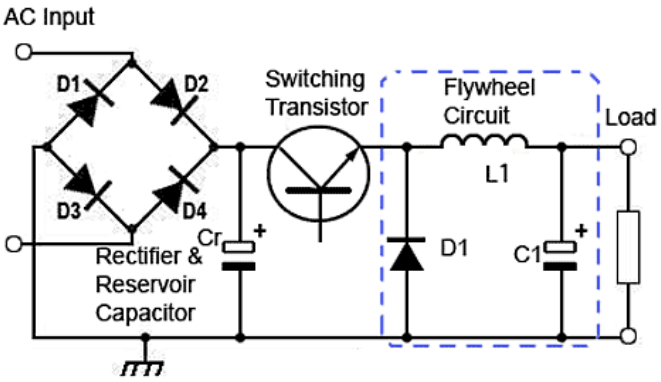


Fig. Buck converter circuit

The buck converter is a form of DC-DC converter that can take an input from DC source as a battery and also it could be DC derived from main AC supply through the rectifier capacitor circuit[1]. The AC input supply is gives to the rectifier circuit or it can be alternate the voltage by step-down transformer. so, the DC voltage is applied to the buck converter circuit.

Then, this DC voltage is converter into AC voltage by chopper or switching transistor. Again it will be reconverted into original DC voltage. Always,

it maintain the constant the output voltage if input supply is does not get the properly and if the input supply is maximum vary.

In winter,time of sunrays are very low.But we need the more power to charge the battery.So,at that time,boost converter is widely used to extracts maximum power and charge the battery.

BOOST CONVERTER

It is a step up converter which steps up voltage or step down current from its supply to load. This converter which DC input voltage is less than the DC output voltage. These converters provides the maximum power efficiency. It step up the input voltage to the required output voltage. An Inductor, a Diode and a high frequency switch is the main part of boost converter[2].

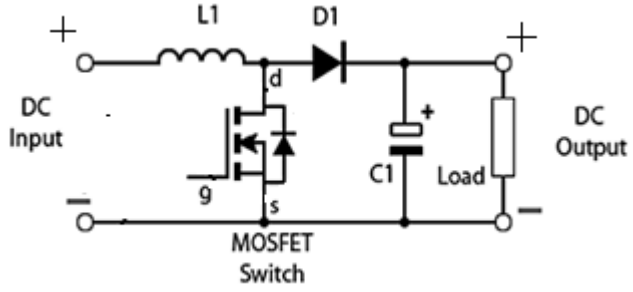


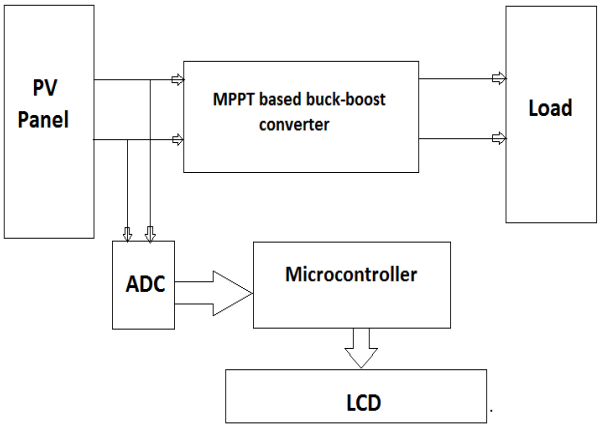
Fig. Boost converter circuit

When the switch is ON,the inductor output is connected to ground and voltage Vin across it.so, the inductor current increases at Vin/L[5] . When the switch ids OFF,voltage across the inductor is changed.so,the output voltage equal to inpu voltage.The boost converter is harvested the Maximum current from the photovoltaic module. In summer,time of sunrays are more.So,more sunrays are followed on the PV module and maximum power stored into the battery.If we used buck converter,it maintain the constant output and prevent overcharge the battery.

VOLTAGE CONSTANT METHOD

In this project,we can implement the MPPT charge controller using the voltage constant method.Constant voltage is term is defined as the output voltage is regulated to a constant value under various conditions ans also it is based on a constant ratio to the measured open circuit voltage[3]. A constant voltage maximum power point that automatically adjust the reference voltage to account for varying environmental conditionis present. The constant voltage MPPT is the simplest method.The operating point of the photovoltaic module is near the maximum power point by regulating the solar output voltage to match an unmovable reference voltage[4].The reference voltage is set equal to voltage at maximum power point of characteristic photovoltaic module.From observ that,the constant voltage technique is more effective than other techniques which are used for MPPT.

BLOCK DIAGRAM



WORKING OF SYSTEM

In our project we use a voltage tracking based system, in which we track the input for optimising maximum power point. We have used IC TL494 for that purposes. The TL494 IC is a fixed frequency variable duty cycle IC, it is operated as DC-DC converter & Tracker.

The TL494 has two in built comparator, we have use one comparator for to maintain output voltage constant whereas another for input voltage tracking purposes. We take overall day analysis on 100W solar panel for checking the operating voltage where achieves a maximum power point, we find

that 13.5 to 14.5 panel voltage achieves maximum power. So if we track this i/p voltage then obtain maximum power every time.This is done by we use TL494 for that purpose, one comparator of TL494 IC compares the input voltage with ref value (set Value i.e. 13.5) i/p voltage lock to this value by adjusting duty cycle (it has inbuilt function). TL494 operates on the frequency of 22Khz by choosing CT & RT value and we use this IC in push pull mode, using centre tapped ferrite core transformer, we have use push pull amplifier based on IRF3205 MOSFETs which will derived through BC547 & BC557 transistor. The output of ferrite core transformer is rectified through a schotky diode and filtered through LC type filter to get pure dc output voltage.

DESCRIPTION

1.This project is divided into two parts. one is the without MPPT and another is with MPPT.

2.In without MPPT, we can directly connected PV module to load and measure the voltage and current by voltmeter and multimeter. Then, calculate the power.

3.In with MPPT, buck-boost converter circuit is connected between the PV module and load. Then, see the power on the lcd display.

4.Now, we have two power readings from two parts. So, we calculate the difference between the two powers in percentage.

5.So, this percentage is called as efficiency and then check the how many efficiency is increased.

6.From this project, we can show the increased efficiency using the MPPT charge controller than without MPPT used.

ACTUAL IMPLEMENTATION

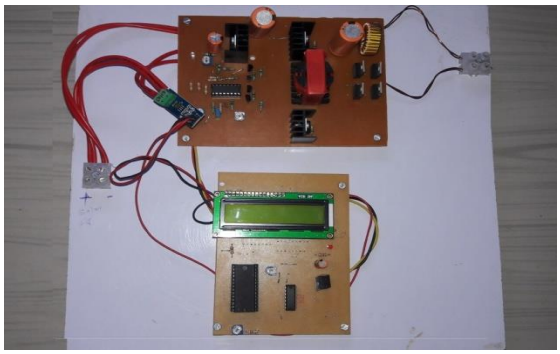


Fig:-Implementation of MPPT Charge Controller

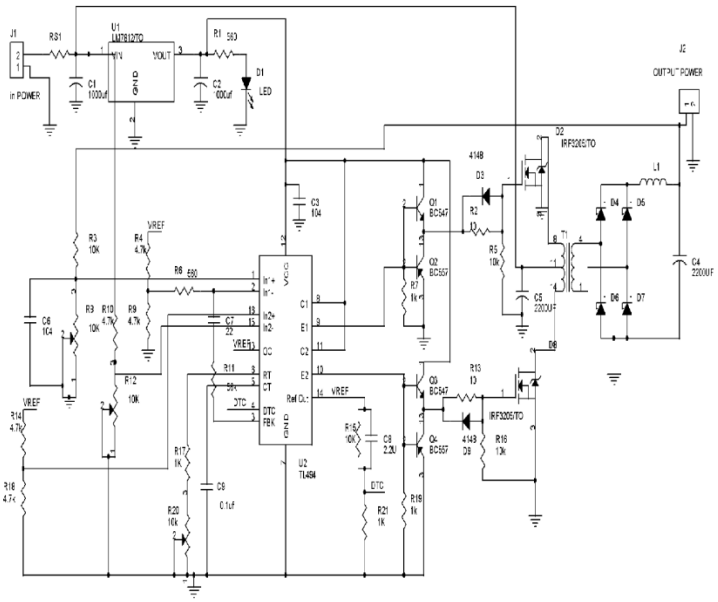


Fig. Experimental Set-up

CONCLUSION

In this project, we have implemented MPPT charge controller system based on buck-boost converter is very efficient to increase the efficiency of solar system and provide the maximum power to load. This system is helpful to reduce the cost of generating power than other techniques of generating power. From this technique.we can increase 25-30% efficiency. Here we implement less system complexity. That means, if we used voltmeter and ammeter to measure the voltage and current. Then, some mistakes are occurred at taking readings. power does not get accurate. so, we

used to lcd display to show directly voltage, current and power. Thats why, we get the accurate power when the buck-boost converter circuit is connected. But in without MPPT we have to used voltmeter and multimeter to measure voltage and current for calculate power.

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