A Review on Maximum Power Point Tracking in Solar Panels

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Abstract —This paper is a study about maximum power point tracking(MPPT) in solar panel. MPPT is a technique which solve the problems in partial shading problem in photovoltaic system (PV). This method is used because SOLAR charge controller(SCC) is the heart of the solar energy. Due to the change in environment and global warming there is a change in the direction of sun, so the MPPT is used. There is also study about the characteristic of MPPT which increase the efficiency and reduce the cost of PV system.

Keywords – solar charge, PV module, MPPT.

I. INTRODUCTION

Maximum power point tracking is used in all this paper to increase the efficiency of power generated by the PV panels. MPPT is define as extraction of maximum available power with the help of PV module. And the voltage produces by the maximum power this point called the “Maximum power point”.The power point tracking is a DC-DC converter with high frequency. It takes the DC input to the solar panel and converts it into the AC, then convert it back to the different DC voltage. Apart from PV panel it requires the transformer and converters. Transformer is required due to the conversion of one form of voltage to the other form and converter is required for the conversion of this ac voltage to again dc voltage.

LITERATURE REVIEW

A brief review of the findings of earlier investigations on the important properties / parameters of MPPT; the available literature on the working method and MPPT algorithm; influence of MPPT usage addition on the characteristics of the MPPT techniques, partial shading, optimal operation ,efficiency , have been presented The section comes to provide information issues in the effort of present research and to focus the significance of the current study, the work already done so far and also to show the relevance of the current research work.

Moein Jazayeri, Sener Uysal and Kian Jazayeri [2014] [1] In this paper two most commonly used algorithm techniques are discussed namely the "Perturb & Observe" and "Incremental Conductance" on the basis of their performance calculation. The platform used for the techniques is MATLAB/SIMULINK. In accordance to the test results of both the algorithm P&O is the simplest whereas the latter one is the advancement of the P&O algo. The result of both the techniques provide almost same efficiencies (η>90%) under identical loading. Although the Incremental Conductance provides comparatively slightly better performance. Thus, the implant of MPPT in Photovoltaic system enhances the maximum power efficiency nearly about 70 %.

Hengyu Li1, Chongyang Zhao1, Hao Wang1, Shaorong Xie1, and Jun Luo1 [2014] [2] This paper shows how the PV cell output power efficiency by using dual axis tracking and maximum power point tracking (MPPT). Both the azimuth angle and the altitude angle can be enabled to track the perpendicular illumination of the sun of the solar panel. The proposed MPPT gives the advantage to track the sun even in cloudy weather. The performance of steady state response and dynamic response speed underrapidly varying weather conditions can also be improved. The MPPT design also provides maximum power point for the PV system. TMD320F2812 controller is used for the implementation of the solar tracking and MPPT. Thus, both the system enhances and improves the PV array Output power efficiency.

B. Pakkiraiah, G. Durga Sukumar [2015] [3] One of the best alternative to the renewable resources is the Solar energy. A new modeling way for MPPT controller are considered with variable irradiance and variable temperature unlike the existed ones. Simulation model and experimental validation analysis are used for the parameters such as power, voltage and current. For the enhanced output of the system, the output of the MPPT is given to DC-DC boost converter and inverter. Thus, the result provides the evidence that on comparison of the proposed MPPT algorithm with the other methods that this method with the boost converters enhances the utilization and efficiency of the system with the effect of the both the variable irradiance and variable temperature.

Raja.B, Satheesh Kumar M.R, Vikash.S, Hariharan.K [2016] [4] In this paper the solution for partial shading problems is discussed by the MPPT controller in the photovoltaic systems using the Equilibration algorithm. In the PV system, it is very necessary to select the point of every instant on the V-I characteristics of the PV generator that where the maximum amount of power transferred from the source to load due to the changing environment. Various

conditions like temperature, solar isolation, shading and array configuration also affect the performance of the PV array. In case of large PV installations such as distributed power generation scheme and residential PV systems, the installed array often gets shadowed, either partially or completely by passing clouds, neighboring buildings and trees. Conventional MPPT will tend to stay at the local maximum power point rather than reaching the global maximum power point which reduces the efficiency of the PV system. Therefore, the equilibration algorithm is helpful to identify the global maximum power point (GMPP).

Md. Rokonuzzaman, Md Hossam-E-Haider [2016] [5] The heart of the solar energy system is the solar charge controller. MPPT, ON/OFF, and PWM are three common types of charge controller. The power extracting capability of MPPT from the solar panel is very high. Aurdunio is used for the improved design of the MPPT solar charger which is discussed in this paper. The proposed system is tested and gave the efficiency of about 97.75% is recorded. This also gives the advantage of external device charging, continuous system status displaying and remote monitoring with data storage. The experimental result of this paper also suggests that the charger can be interfaced with more than one renewable source to power grid through an inverter.

Weiping Zhang, Peng Mao, Xiaoxiao Chan [2016] [6] To increase the output power of PV array it is a necessity to track the MPP accurately and quickly. This paper concentrates on the four methods which is applied to partial shading conditions. The four different MPPT methods are current sweeping, mismatching compensation, variable step size incremental resistance MPPT and Two stage method.

S. M. Reza Tousi, Mohammad Hassan Moradi, Naser Saadat Basir, Milad Nemati [2015] [7] This paper provides a function which can be used for the determination of the duty cycle of the DC-DC converter for maximum power point tracking in any environment or load situation in PV systems. This function is a contrary to many algorithms to behave in correctly in situations like abrupt irradiance changes which produces wrong duty- cycle. Different experiments/ simulations have been conducted with respet to the start-up, steady state and dynamic performance compared to some major MPPT techniques. All these results, that this functioning algorithm can enhance both the steady state and dynamic performance of the system simultaneously.

In case of load variations and measurement noise the proposed algorithm behaves robustly, also to its advantages, its simplicity of the design.

Mohammad Amin Ghasemi, Hossein Mohammadian Forushani, Mostafa Parniani[2015][8] In the PV characteristics of the PV array, it will have multiple peak points under partial shading conditions but only one of which is global maximum. This paper is a method presented to overcome the drawback of conventional MPPT methods by using the novel two-stage MPPT method. This process consists of two stages, first stage is for the partial shading condition determination. Second stage, is based on the ramp change of duty cycle for the use of the algorithm and continuous sampling of array from the PV characteristic and global maximum power point of the PV array is reached. MATLAB/SIMULINK is used for the result calculations. The results show that it is simple and a cheap microcontroller can be used in the implementation with high adjustable speed. The efficiency is independent to the model of modules and has minimum negative impact on the connected power system.

Jubaer Ahmed, Zainal Salam [2016] [9] The method to reduce the steady the oscillations and to mitigate the probability of losing the tracking direction is proposed in this paper of the P&O based MPPT for the PV system. To avoid the algorithm to diverge form the tracking locus a dynamic boundary condition is eloped. The process is done in MATLAB Simulink.

Ali Chikh, Ambrish Chandra [2015][10] in this paper the MPPT method is used for the PV system with reduced hardware setup. This determined by the calculation of the instantaneous conductance and the junction conductance of the array. This calculation is done of the first by utilizing the array voltage and current. Whereas, the junction conductance which is a function of the array junction current, is calculated using an adaptive neuro-fuzzy solar cell. The proposed system helps to minimize the hardware setup by using single voltage sensor with the increase in the array power efficiency as well as the MPPT response time. This set not only reduces the hardware set up as well makes the operation optimal.

D. R. Espinoza-Trejo, E. Bárcenas-Bárcenas, D. U. Campos-Delgado, C. H. De Angelo [2013] [11] In this paper MPPT technique is a robust input-output linearization controller. This is implemented in a PV buck DC-DC converter with the usage in DC Microgrids, solar vehicles or stand-alone systems. The MPPT technique is passed through experimental calculations of the closed loop performance under different condition of abrupt irradiance, set point changes, parametric uncertainty and disturbances rejection.**D. S. Karanjkar, S. Chatterji, Shimi S. L.,Amod Kumar [2014] [12]** This paper deals with the real-time simulation and analysis of MPPT which controls the voltage and the current of the PV system

to produce maximum power to the load. Voltage, current, radiation and temperature sensors have been used to implement five MPPT algorithm on laboratory prototype.

Tracking efficiency, steady-state and dynamic behavior are the basis on which the performance of the MPPT methods are compared under varying solar radiaions.

CONCLUSION

On the study of above mentioned Review paper, following conclusion are obtained regarding micro power point tracking of solar panel:

- Solar energy is the most important resources at that time, so with the help of MPPT generate the maximum amount of power with PV panel.
- MPPT uses a DC-DC converter. So, its efficiency is higher than the other controller like- PWM.
- With the use of MPPT techniques idea for the generation of power with the help of distribution system also increased.
- In which PV characteristic, also explain with the help of this we find the maximum global point for the tracking.

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