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A MAXIMUM POWER POINT TRACKER FOR LONG TERM LOGGING USING PV MODULE PERFORMANCE

S.R.Deokar[1], L.H.Disale[2], S.B. Malve[3], S.R.Karpe[4,]
UG Students Dept. of EE, S. B. Patil College Engineering College, Indapur, Maharashtra, India[1-3]
Assistant professor, Dept. of EE, S. B. Patil College Engineering College, Indapur, Maharashtra, India[4]

ABSTRACT:

Renewable energy sources are not having any alternative in this era as the demand of electricity is increasing every year continuously. Development of any country can be decided by per capita energy consumption of that country. The shortage of electrical energy can be overcome by the development of the solar energy in coming future. Solar energy is vital and a source having huge potential. The efficiency and output optimization of the solar system is need of time in order to make solar energy as a capable option. Authors have presented the system of photovoltaic module used for absorption of solar energy. To extract the maximum power from solar source, it is necessary to monitor the Maximum Power Point (MPP). Monitoring the performance and studying system stability is possible by the proposed module. Monitoring, analysis and storing the data is possible by this module. The performance evaluation of the system is necessary to understand the scope of improvement for solar system.

KEYWORDS: maximum power point tracker, Performance evaluation, Photovoltaic cells, power MOSFET, Microcontroller, Stepper motor

I.INTRODUCTION:

The photovoltaic system has found applications in charging, water pumping, satellite power systems, etc. It is really necessary to operate the PV system at maximum power point MPP. Improving the output and efficiency is necessity of time as this system is needed to be used for wide range of applications [1]. Several development have been proposed by the researcher to improve the non renewable systems .Solar system has found to be one of the most reliable, low cost, environment friendly resource of electricity. [2]. Various maximum solar power tracking technique (MPPT) are popular for photovoltaic system.

Generally, if the load is connected directly to solar panel, the maximum power point cannot be achieved. If the load is directly connected to the solar system, then huge size of solar panel will be required, hence cost of total system will be increased. Hence to overcome these, converters are used for power conversion between the load and the solar panel. Hence the solar panels finds the applications in stand-alone (water pumping, domestic and street lighting, electric vehicles, military and space applications) or grid-connected configurations (hybrid systems, power plants).

In recent years, research has been done on improving the capabilities of MPPT algorithms, partly driven by the availability of more powerful control circuitry. However, even a quite simple hill-climbing or perturb-and-observe algorithm can give sufficient accuracy and response speed to assess the power output of PV modules to within a few percent of error margin over a wide range of irradiances.

The major problems associated with the solar system, are the less conversion efficiency under certain environmental conditions and the solar cell V-I characteristic is nonlinear and varies with irradiation and temperature.

Unfortunately, PV generation systems have two major problems: the conversion efficiency of electric power generation is very low, especially under low irradiation conditions, and the amount of electric power generated by solar arrays changes continuously with weather conditions. The maximum efficiency is achieved by Maximum Power Point Tracking (MPPT) techniques. Moreover, the solar cell V-I characteristic is nonlinear and varies with irradiation and temperature. In general, there is a unique point on the V-I or V-P curve, called the Maximum Power Point (MPP), at which

OBJECTIVES:

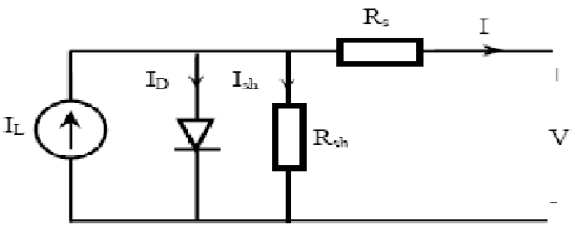
1) System should be simple as possible
2) Cost effective to all people
3) Accurate reading

II. PHOTOVOLTAIC SYSTEM:

A Photovoltaic (PV) system directly converts solar energy into electrical energy. The basic device of a PV system is the PV cell. Cells may be grouped to form arrays. The voltage and current available at the terminals of a PV device may directly feed small loads such as lighting systems and DC motors or connect to a grid by using proper energy conversion devices. This photovoltaic system consists of main parts such as PV module, charger, battery, inverter and load.

a. EQUIVALENT MODEL:

A Photovoltaic cell is a device used to convert solar radiation directly into electricity. It consists of two or more thin layers of semiconducting material, most commonly silicon. When the silicon is exposed to light, electrical charges are generated. A PV cell is usually represented by an electrical equivalent one-diode model shown in fig.1



The model contains a current source, one diode, internal shunt resistance and a series resistance which represents the resistance inside each cell. The net current is the difference between the photo current and the normal diode current is given by the equation.

$$ID = Io\left[e^{q(V+IRs)} - 1\right] \quad \text{........................(1)}$$

$$I = IL - IO\left[e^{q(V+IRs)} - 1\right] - \frac{V+IRs}{Rsh} \quad \text{..........................(2)}$$

Where
I is the cell current (A).
q is the charge of electron (coul).
K is the Boltzmann's constant (j/K).
T is the cell temperature (K).
is the photo current (A).
Io is the diode saturation current.(A)
Rs , Rsh are cell series and shunt resistances (ohms). V is the cell output voltage (V).

b. CURRENT – VOLTAGE CURVE FOR PV CELL:

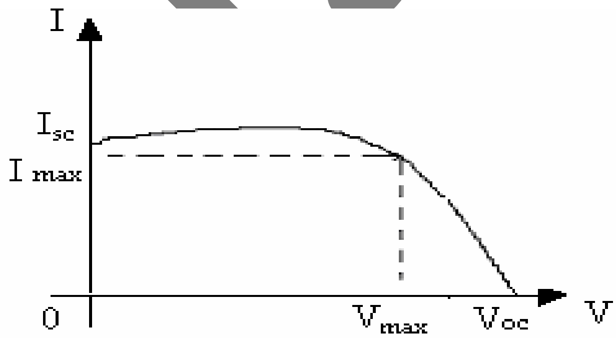


Fig.2 Voltage-Current Curve

The Current – Voltage characteristic curve of a PV cell for certain irradiance at a fixed cell temperature is shown in fig.2. The current from a PV cell depends on the external voltage applied and the amount of sunlight on the cell. When the PV cell circuit is short, the current is at maximum and the voltage across the cell is zero. When the PV cell circuit is open, the voltage is at maximum and the current is zero.

c. POWER – VOLTAGE CURVE FOR PV CELL:

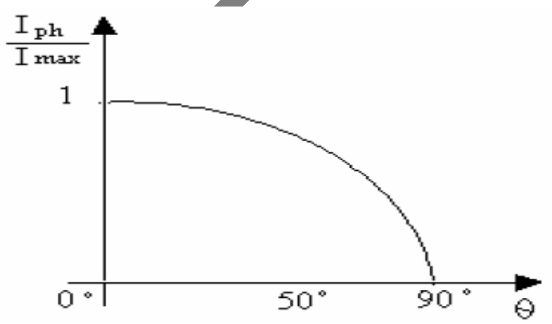


Fig 3. Power-Voltage Curve

The Power – Voltage curve for PV cell is shown in fig.3. Here P is the power extracted from the PV array and V is the voltage across the terminals of the PV array. This curve varies due to the current insolation and temperature. When insolation increases, the power available from PV array increases whereas when temperature increases the power available from PV array decreases

III. MAXIMUM POWER POINT TRACKING:

Maximum power point plays an important role in photovoltaic system because they maximize the power output from a PV system for a given set of conditions, and therefore maximize the array efficiency. There are different methods used to track the maximum power point are

1. Perturb and Observe method
2. Incremental Conductance method
3. Parasitic Capacitance method
4. Constant Voltage method

Among the different methods used to track the maximum power point, Perturb and Observe method is the most widely used method in PV MPPTs and is highly competitive against other MPPT methods.

IV. PERTURB AND OBSERVE METHOD:

This is the one of the method to identify, maximum power tracking point. The power generation of the solar system can be observed and the changes are made in order to achieve the maximum power output. The direction of photovoltaic panel is changed and related changes in the magnitude of power output are observed. The movement of the panel continues till the continuous maximum power output is achieved form the system. In order to keep the power variation small the perturbation size is kept very small. A PI controller is used for moving the panel. The only drawback of this method is, it is not so useful in fast varying atmospheric conditions.

IV. SYSTEM DISCRIPTION:

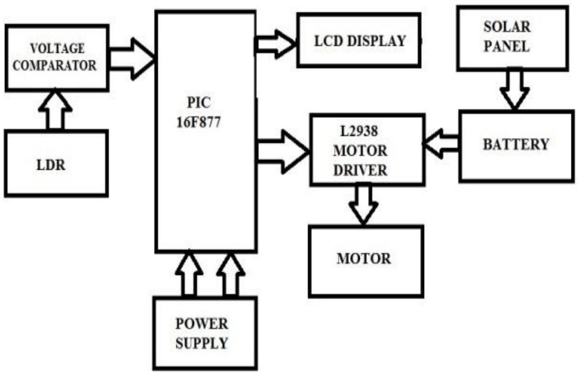


Fig.5. Schematic of diagram MPPT system.

In the proposed module, MPP is used to identify the inefficient solar panel. The voltage sensor is used to provide the reference voltage for MPPT. The V-I characteristics of the panel are studied in detail. The control action is taken by controller with reference to the data collected from the system. The generated power is stored in Li-on batteries. The condition of the panel is studied and if necessary it will be replaced. Generally 30 to 40% of the incident energy is converted to electricity; hence it is necessary to implement maximum power point tracking.

The operating characteristics of a solar cell consist of two regions as represented in Fig 1, the current source region and the voltage source region. In the current source region, the internal impedance of the solar cell is high and this region is located on the left side of the current-voltage curve. The voltage source region, where the internal impedance is low, is located on the right side of the current –voltage curve. As per Maximum Power Transfer Theorem, Maximum Power is delivered to load when source internal impedance matches load impedance.

V.RESULT TABLE:

SR. NO	Solar Plate Position (in Angle)	Sun Position as per Day	Output Voltage (V)	Efficiency (%)
1.	30	Morning	7.2	92
2.	60	Early Afternoon	7.5	93
3.	90	Afternoon	8	97
4.	120	Evening	7.8	95

As per the change the sun position in day time that solar plate will move and give the constant output at a load side.

VI. CONCLUSION:

The Proposed MPPT concept combines the advantages of the I-V scan based MPPT in that it always find the global MPP- with the simple partial shadow detection unit. This minimizes the power loss due to the scanning process by activating the scan only when partial shadow conditions are detected. Two Essential advantage of the method are its simplicity. Since the partial shadow detection unit can be combined with any MPPT algorithm with minimum cost.

REFERENCES:

[1] S.R.Deokar1 , L.H.Disale2 , S.B. Malve3 , Y.G.Abhale4, "Review On Maximum Power Point Tracker For Long Term Logging Using Pv Module Performance", International Journal Of Research Publications In Engineering And Technology [Ijrpet], ISSN: 2454-7875 VOLUME 2, ISSUE 2, Jan. -2016

[2] Uwe Zimmermann, and Marika Edoff, *"A Maximum Power Point Tracker for Long-Term Logging of PV Module Performance"* IEEE Journal of Photovoltaics, Vol.. 2, N°. 1, 2012.

[3] Sonali Surawdhaniwar and Mr. Ritesh Diwan, "Study of Maximum Power Point Tracking Using Perturb and Observe Method", International Journal of Advanced Research in Computer Engineering & Technology Volume 1, Issue 5, July 2012, ISSN: 2278 – 1323

[4] Ir Dr Edward LO Associate Professor Department of Electrical Engineering , PV Cells- Working Principle and Applications by The Hong Kong Polytechnic University..

[5] S. Leva, D. Zaninelli, *"Hybrid Renewable Energy-Fuel Cell System: design and performance evaluation",* Electric Power Systems Research, Vol. 79, 2009, pp.316-324 – ISSN 0378-1649– Rivista ISI

[6] M.E.Ahmad and S.Mekhilef, *"Design and Implementation of a Multi Level Three-Phase Inverter with Less Switches and Low Output Voltage Distortation ,"* Journal of Power Electronics, vol. 9, pp. 594-604, 2009.