



# INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X

Impact Factor: 6.078

Available online at: [www.ijariit.com](http://www.ijariit.com)

## PV POWERED AGRI PUMPING SYSTEM BASED MPPT ALGORITHM

Mrs. Radhika Somakumar<sup>1</sup>, Mohamed Khalid N.<sup>2</sup>, U. Anban<sup>3</sup>, S.Sudharson<sup>4</sup>

Assistant Professor<sup>1</sup>, UG Scholar<sup>2</sup>, UG Scholar<sup>3</sup>, UG Scholar<sup>4</sup>

Department of Electrical and Electronics Engineering

Agni College of Technology, Chennai, Tamil Nadu, India

**Abstract**—Solar water pumping systems are a modern but field-proven means of pumping water in locations where access to grid power is not available, or where the grid is not reliable. These projects use photovoltaic cells to convert sunlight into electricity to power DC pumps which can be used to pump groundwater or surface water. This system provides power at all times even on cloudy days. To increase efficient irrigation in agriculture. This system to achieve dc supply to ac supply can be used for pumping application. Dc-Dc Buck-Boost converter used in pumping system is to stabilize the voltage for induction motor. The buck-boost converter is used to step up and step down the input voltage. A solar photovoltaic water pumping system consists of a PV array, motor pump set, associated electronics, and an on/Off switch.

**Keywords**—MPPT, LCD Display, Electrical Transformer, Rectifier, Filters, PIC Microcontroller.

### 1. INTRODUCTION

Solar water pumping systems are a modern but field-proven means of pumping water in locations where access to grid power is not available, or where the grid is not reliable. These systems use photovoltaic (PV) cells to convert sunlight into electricity to power DC pumps which can be used to pump groundwater or surface water. A solar-powered water pumping system is made up of two components, a Solar panel - Photovoltaic module Pumps Centrifugal -Submersible Solar panel refers to a panel designed to absorb the sun's rays as a source of energy for generating electricity or heating. A photovoltaic (in short PV) module is a packaged, connected assembly of typically 6×10 solar cells. Solar Photovoltaic panels constitute the solar array of a photovoltaic system that generates and supplies solar electricity in commercial and residential applications. Each module is rated by its DC output power under standard test conditions, and typically ranges from 100 to 365 watts. The efficiency of a module determines the area of a module given the same rated output – an 8% efficient 230-watt module will have twice the area of a 16% efficient 230-watt module. There are a few commercially available solar panels available that exceed 22% efficiency and reportedly also exceeding 24%. Centrifugal pumps are a sub-class of dynamic

axisymmetric work-absorbing turbomachinery. Centrifugal pumps are used to transport fluids by the conversion of rotational kinetic energy to the hydrodynamic energy of the fluid flow. The rotational energy typically comes from an engine or electric motor. The fluid enters the pump impeller along or near the rotating axis and is accelerated by the impeller, flowing radially outward into a diffuser or volute chamber (casing), from where it exits. A submersible pump is a device that has a hermetically sealed motor close-coupled to the pump body. The whole assembly is submerged in the fluid to be pumped. The main advantage of this type of pump is that it prevents pump cavitation, a problem associated with a high elevation difference between the pump and the fluid surface. Submersible pumps push fluid to the surface as opposed to jet pumps having to pull fluids.

### 2. EXISTING SYSTEM

The main objective is to design a low-cost and time-based irrigation system with the help of a renewable energy system. The performance of a solar-powered water pump was as equal to a pump powered by a conventional one. The efficiency of solar-based water pumps is much higher than conventional power-based water pumps. The main advantage of this type of pump is that it prevents pump cavitation, a problem associated with a high elevation difference between the pump and the fluid surface. Submersible pumps push fluid to the surface as opposed to jet pumps having to pull fluids.

### 3. BLOCK DIAGRAM

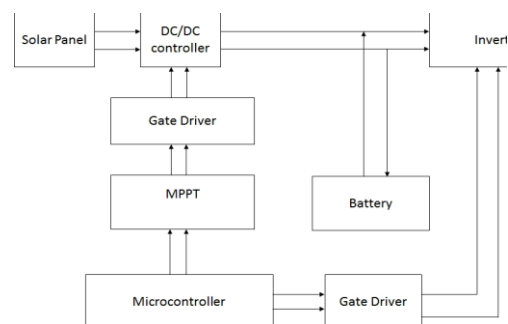


FIGURE 1: BLOCK DIAGRAM

#### 4. METHODOLOGY

##### A. PIC CONTROLLER

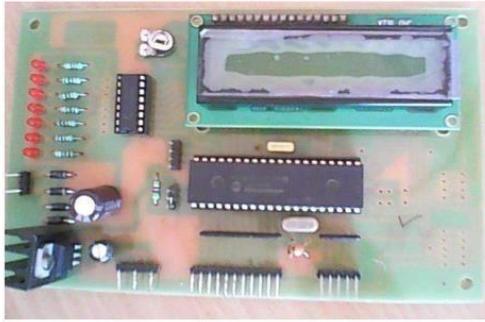


FIGURE 2: PIC CONTROLLER

PIC 16F877 is one of the most advanced microcontrollers from Microchip. This controller is widely used for experimental and modern applications because of its low price, a wide range of applications, high quality, and ease of availability. It is ideal for applications such as machine control applications, measurement devices, study purposes, and so on.

##### B. SUBMERSIBLE PUMP

A submersible pump is a centrifugal pump (Figure 1), which is attached to an electric motor and operates while submerged in water. The sealed electric motor spins a series of impellers (Figure 2). Each impeller in the series forces water through a diffuser into the eye of the one above it. In a typical 4-inch submersible pump, each impeller will add approximately 9 psi of pressure. For example, a typical 10-stage pump will develop a pressure of about 90 psi at its outlet (i.e. 10 impellers x 9 psi). The capacity of the pump is determined by the width of the impeller vanes and its pressure by the number of impellers. As an example, a 1/2 horsepower 7-stage pump may deliver a high volume of water at low pressure while a 1/2 horsepower 14-stage pump will deliver a lower volume but at a greater pressure. Like all other centrifugal pumps, an increase in good depth or discharge pressure will reduce the capacity.

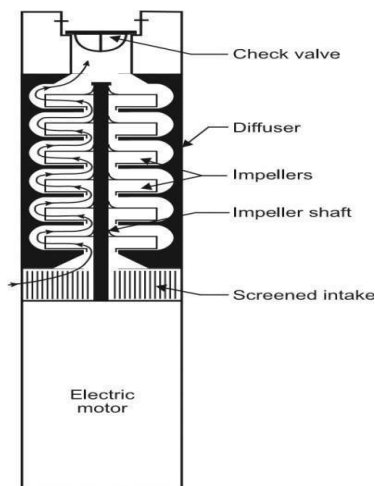


FIGURE 3: SUBMERSIBLE PUMP

##### C. DUAL POWER SUPPLY

The power supply gives supply to all components. It is used to convert AC voltage into DC voltage. Transformer used to convert 230V into +12V and -12V AC. 12V AC is given to diode. The diode range is 1N4007, which is used to convert AC voltage into DC voltage. AC capacitor used to charge AC components and discharge on ground. LM 7805 and LM 7905 regulator is used to maintain voltage as constant. Then the signal will be given to the next capacitor, which is used to filter unwanted AC components. The load will be LED and

resistor. The LED voltage is 1.75V. if the voltage is above level beyond the limit, and then it will be dropped on the resistor.

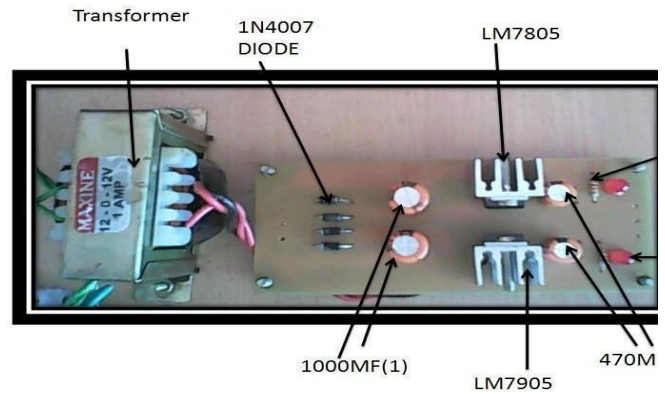


FIGURE 4: DUAL POWER SUPPLY

##### D. ELECTRICAL TRANSFORMER

A Transformer is an electrical device that takes electricity of one voltage and changes it into another voltage. In AC circuits, AC voltage, current, and waveform can be transformed with the help of Transformers. Transformer plays an important role in electronic equipment.



FIGURE 6: ELECTRICAL TRANSFORMER

AC and DC voltage in Power supply equipment is almost achieved by transformer's transformation and commutation. A Transformer changes electricity from high to low voltage or low to high voltage using two properties of electricity. In an electric circuit, there is magnetism around it. Second, whenever a magnetic field change (by moving or by changing strength) a voltage is made.

##### E. LCD DISPLAY

Liquid Crystal Displays (LCDs) have materials, which combine the properties of both liquid and crystals. Rather than having a melting point, they have a temperature range within which the molecules are almost as mobile as they would be in a liquid, but are grouped in an ordered form similar to a crystal. An LCD consists of two glass panels, with the liquid crystal material sandwiched in between them. The inner surface of the glass plates is coated with transparent electrodes which define the character, symbols or patterns to be displayed. Polymeric layers are present in between the electrodes and the liquid crystal, which makes the liquid crystal molecules maintain a defined orientation angle. One each polarizer is pasted outside the two glass panels. This polarizer would rotate the light rays passing through them to a definite angle, in a particular direction. When the LCD is in the off state, light rays are rotated by the two polarizers and the liquid crystal, such that the light rays come out of the LCD without any orientation, and hence the LCD appears transparent. When sufficient voltage is applied to the electrodes, the liquid crystal molecules would be aligned in a specific direction.

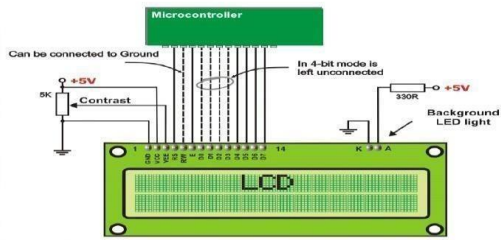


FIGURE 7: LCD

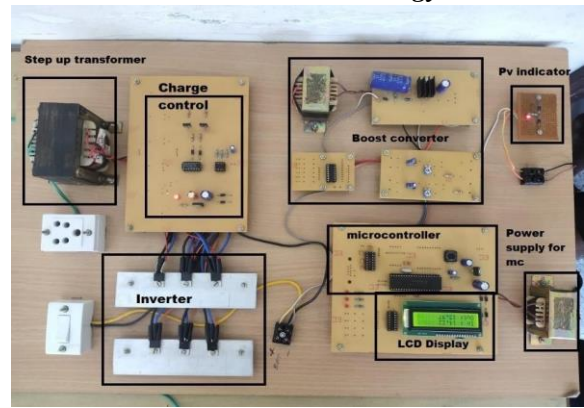


FIGURE 9: COMPLETE HARDWARE KIT

**5. WORKING**

In this proposed system we used MOSFET, IGBT Inverter, and battery backup system. The MOSFET is used in this system to provide the constant dc voltage. The IGBT inverters are used to convert dc to ac voltage. This system is used a three-phase squirrel cage induction motor for pumping application. The battery backup method is used in this system to store the energy in the daytime and is used for night times. Maximum power point tracking (MPPT) is a technique used commonly with wind turbines and photovoltaic (PV) solar systems to maximize power extraction under all conditions. The fuzzy logic method is used in this paper. fuzzy logic is a form of much-valued logic in which the truth values of a variable may be any real number between 0&1 considered to be “fuzzy”. By contrast, in Boolean logic, the truth values of variables may only be 0 or 1, often called “crisp “values. Fuzzy logic has been employed to handle the concept of partial truth, where the truth value may range between completely false. Furthermore, when linguistic variables are used, these degrees may be managed by specific (membership) functions. The battery backup method is to provide power at all-time even on cloudy days. The main aim of the system is to achieve dc supply to ac supply which can be used for pumping applications. In these three phases, ac supply is used for pumping application.



FIGURE 10: SOLAR PANEL

**6. RESULTS**



FIGURE 11: VOLTAGE 12, AMPERE 7.5AH

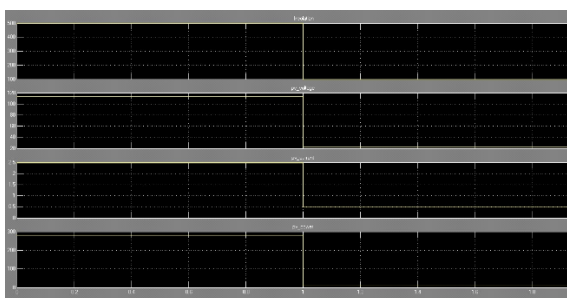
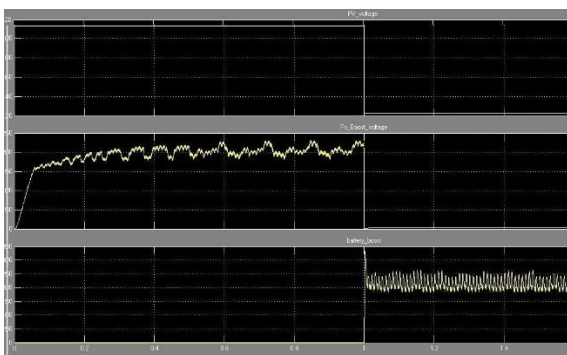


FIGURE 8: PV RESULT



FIGURE 12: OUTPUT OF THE SUBMERSIBLE PUMP

**7. CONCLUSION**

Solar-powered water pumping systems have become commercially popular due to proper financing schemes by the government. MPPT techniques are being used to improve the performance of solar-powered water pumping systems during fluctuations in solar intensity. The following major limitations of Solar powered water pumping systems are identified. The main aim of the system is to achieve dc supply to ac supply which can be used for pumping applications.

## 8. REFERENCES

- [1] Srushti R., Uttam B. Vaidya., "Incremental Conductance MPPT Technique for PV System", IJAREEIE, Vol. 2, issue 6, June 2013. " comparison of maximum power point tracking algorithms for photovoltaic system" International Journal of Advances in Engineering & Technology, Nov2011.
- [2] "A Single-Stage Grid-Connected Inverter Topology for Solar PV Systems with Maximum Power Point Tracking", IEEE Trans. on Power Electronics, vol. 22, pp. 1928-40, 2007.
- [3] Protogeropoulos, C., Tselepis, S., And Neris, A., "Research Issues on Standalone PV/Hybrid Systems: State-of-Art and Future Technology Perspectives for the Integration of Microgrid topologies on Local Island Grids", IEEE Photovoltaic Energy Conversion Conference, vol. 2, pp. 2277-82, May 2006.
- [4] Ministry of New and Renewable Energy, Jawaharlal Nehru National Solar Mission, "Solar Photovoltaic Water Pumping Systems", 2013-14.
- [5] Solodovnik, E.V., Liu, S. And Dougal, R.A., "Power Controller Design for Maximum Power Tracking in Solar Installations", IEEE Trans. Power Electronics, vol. 19(5), pp. 1295-304, 2004.
- [6] A. Moussi, A.Betka and B. Azoui, ,, Optimum design of a photovoltaic pumping system", UPEC99, Leicester UK, 1999.
- [7] S. Sujith and N. Kathiravan, "Comparison of fuzzy logic based MPPT with P & O for a solar PV pumping system," 2016 International Conference on Emerging Technological Trends (ICETT), Kollam, 2016, pp. 1-7, DOI: 10.1109/ICETT.2016.7873755.
- [8] R. K. Pachauri and Y. K. Chauhan, "Fuzzy logic controlled MPPT assisted PV-FC power generation for a motor driven water pumping system," 2014 IEEE Students' Conference on Electrical, Electronics and Computer Science, Bhopal, India, 2014, pp. 1-6, DOI: 10.1109/SCEECS.2014.6804485.
- [9] Jin C, Jiang W. Design of a digital controlled solar water pump drive system for a nanofiltration system. IEEE PEDS, Singapore, 2011 Eker B. Solar powered water pumping systems. Trakia Journal of Sciences 2005, 3(7): 7–11
- [10] Harishankar SR, Sathish Kumar K P, Sudharsan U, Vignesh T. Viveknath. Solar-powered smart irrigation system. Journal of Research India Publications on Advance in Electronic and Electric Engineering, 2014, 4: 341.
- [11] Kolhe M, Joshi J C, Kothari D P. Performance analysis of a directly coupled photovoltaic water-pumping system. IEEE Transactions on Energy Conversion, 2004, 19(3): 613–618
- [12] Jaziri S, Jemli K. Optimization of a photovoltaic powered water pumping system. In: IEEE International Conference on Control, Design and Information Technologies. Hammamet, Tunisia, 2013, 422–428.