

Execution of PV supported Wet Processor with Improved performance for Domestic Application

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Abstract: This paper is exhibited for running of solar based wet processor using Photovoltaic frameworks and due to absence of battery it will perform at minimum cost and aims to holds out the DC source which step up from the PV panel and concatenate to an inverter to give an AC outcome and coupling of motor to the wet processor is driven by an Inverter. Perturb and Observe (P&O) calculation based Maximum Power Point Tracker (MPPT) utilized for enhancing productivity of the framework and by accomplishing a compelling PV based wet grinding system without a need for storage purpose. The outcomes are exhibited on accessibility of solar irradiance and simulation result comes about by utilizing MATLAB/SIMULINK which predicts the Open and closed loop system model.

Keywords- Photovoltaic (PV), Boost Converter, perturb and observe (P&O), Maximum power point tracker (MPPT), Induction motor.

I. INTRODUCTION

Sun oriented energy is the most ease, widespread wellspring of energy as daylight's all through. Sunlight based energy changed over into electrical energy helpfully by photovoltaic innovation. Including boards are expanded the introduced control in the PV framework it can be alluring highlights of PV innovation. Among the numerous uses of PV energy, pounding is the most encouraging. In the framework, when daylight is accessible sun oriented energy are put away. Crushing to remote home are met from the sun oriented based wet Grinder. The majority of the PV frameworks are associated specifically to the DC motor. Sun oriented. fueled wet processor worked with AC drive utilizes an inverter with air conditioning motor. Acceptance motor offer capacity to pick as far as toughness, productivity, size, and viability.

Supported the DC control from sun based exhibit and sustained to an inverter which gives air conditioning. Motor are coupled to the Grinder which drive by air conditioning yield from inverter. Photovoltaic power framework generally influence vital of most extreme input to point following (MPPT) controller, which is an electronic framework that works the Photovoltaic (PV) modules to enables the modules to create all the power they will accomplish a predetermined thing [1]. MPPT calculations

are distinctive writes like as Perturbation and Observation (P&O) Method, incremental conductance strategy and so forth. There are preferences in avoid utilization of vast banks of lead corrosive batteries, which are overwhelming, expensive and have one fifth of lifetime of PV board[4]. Various item utilize dc motor driven in a few sections of the world, however they experience the ill effects of procedure of protecting a condition because of the nearness of the commutator and brushes.

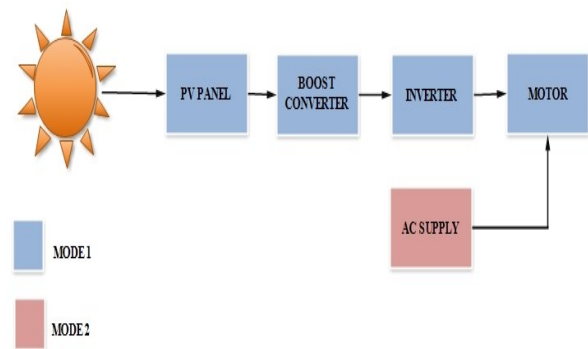


Fig.1 Basic Block Diagram

Fig.1 shows the block diagram of this proposal. It comprises of Solar board, support converter, MPPT controller, inverter, Load. Voltage sensor and current sensor used to detect the voltage and current from the board. MPPT controller acquires the info voltage and current from the board. These qualities can be advance agreeing into the MPPT calculation to track the Maximum power purpose of sun oriented board. The contribution to DC-DC converter from the yield of MPPT square is utilized as which might be voltage parameter or obligation cycle.

The working voltage keeping up at the Maximum power point with help of DC-DC converter. By changing the obligation cycle of DC -DC converter. In this paper advance up the working voltage at the most extreme power point utilizing Boost converter. Between the suns powered board and load DC-DC control converter are associated. The MPPT piece are heart of the model which finding the Maximum working purpose of sun powered board [1]. It gives gating sign to Boost converter to Maintains the working voltage at the most extreme working point regardless of temperature and sun oriented irradiance.

II. BOOST CONVERTER

A Boost converter is a switch mode DC-DC converter in which the output voltage is greater than the input voltage and in this paper this converter plays a vital role to step the voltage to the desired extent to attain the best outcome.

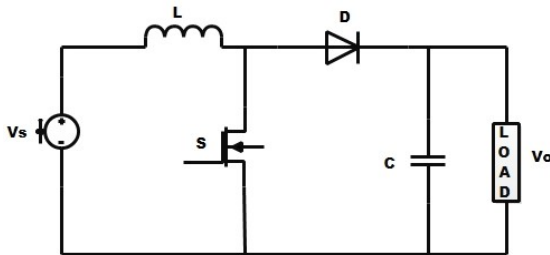


Fig 2. Equivalent circuit of Boost Converter

The diode will be open circuited. When switch is ON since the cathode of diode have higher voltage contrast with the anode which is shorted to ground through the switch [3]. At the point when switch is on circuit can be redrawing.

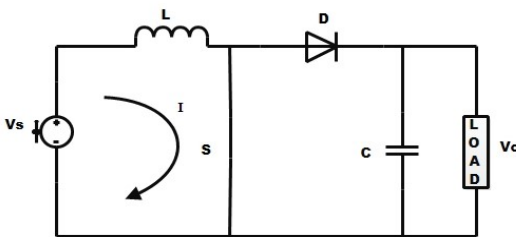


Fig 3. Equivalent circuit of Boost switch ON condition

The diode will be short circuited. When switch is off the boost converter circuit can be redraw as follow

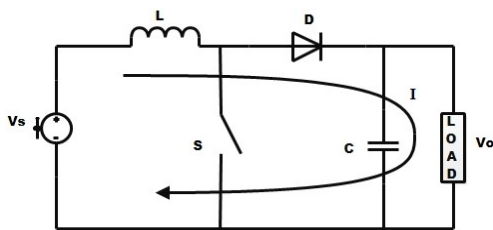


Fig 4. Equivalent circuit of Boost switch ON condition

A. Design of Circuit Components

$$\text{Maximum Duty cycle } D = 1 - \frac{V_{in(min)} \cdot \eta}{V_{out}} \quad (1)$$

$V_{in(min)}$ = Minimum input voltage

V_{out} = desired output voltage

η = efficiency of the converter, e.g. estimated 85%

$$\text{Inductor Ripple Current } \Delta I_L = \frac{V_{IN(min)} \cdot D}{f_s \cdot L}$$

(2)

$V_{IN(min)}$ = minimum input voltage

D = duty cycle calculated

f_s = minimum switching frequency of the converter

L = selected inductor value

$$\text{Inductor Calculation: } L = \frac{V_{IN} \cdot (V_{OUT} - V_{IN})}{\Delta I_L \cdot f_s \cdot V_{OUT}} \quad (3)$$

= typical input voltage

= desired output voltage

= minimum switching frequency of the converter

= estimated inductor ripple current.

$$\text{Minimum Output Capacitance, } C_{OUT} \quad (4)$$

= maximum output current of the application

D = duty cycle calculated in Equation 14

= minimum switching frequency of the converter

= desired output voltage ripple

Table 1
 Designed Values of Boost Converter

S.NO	Parameters	Design Values
1	Input Voltage	120V
2	Output Voltage	230V
3	Inductance	6.893μH
4	Capacitance	4F
5	Load Resistance	53Ω
6	Switching Frequency	25KHz

III. PV WITH MAXIMUM POWER POINT TRACKING

Maximum power point is a method utilized all the time in photovoltaic (PV) universes to make as expansive power taking out under all conditions [7]. PV galaxies happen in a wide range of mix with consider to their relationship to outside networks, inverter frameworks, or other electrical burdens.

Thought for definite goal of the photograph voltaic power, however, the focal inconvenience tended to through MPPT is that the effectiveness of information exchange from the sunlight based cell relies upon both the amount of sunshine falling on the photograph voltaic boards and the electrical qualities of the heap [8].

As the amount of daylight shifts, the heap trademark that gives the most ideal power exchange effectiveness changes,

with the goal that the proficiency of the machine is improved when the heap credit acclimations to protect the power switch at most noteworthy productivity [9]. This heap trademark is known as the most extreme power factor and MPPT is the way toward discovering this point and safeguarding the heap quality there.

A. Perturb and Observe Algorithm

In this approach the controller alters the voltage through a little amount from the cluster and measures control if the quality increments, correspondingly changes in that course are attempted until power never again increments. This is alluded with perturb and observe technique and in spite of the fact that this strategy can final product in motions of quality yield [1].

It is alluded to as a slope climbing technique, since it relies upon the upward push of the bend of contribution to restriction to voltage under the most power points, and the fall over that point. Perturb and observe is the most ordinarily utilized MPPT system because of its simplicity of execution. Bother and observe approach may likewise bring about best level proficiency, supply that a satisfactory perturb and observe slope climbing strategy is embraced.

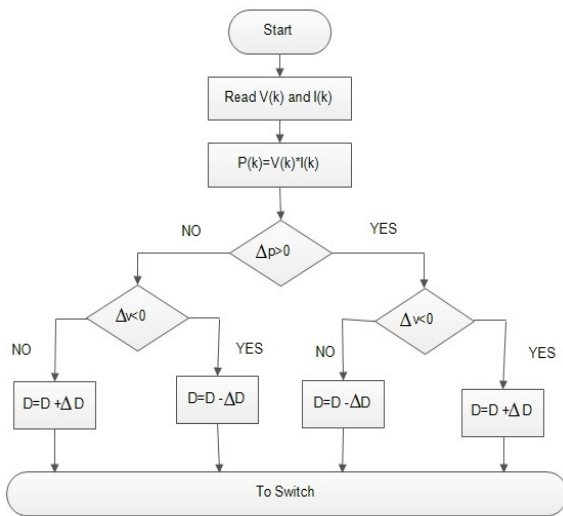


Fig 5.Flow Chart Of Perturb and Observe Algorithm

IV. SINGLE PHASE INDUCTION MOTOR

Single stage control frame work are widely utilized as a part of home utility and business reason and to some degree in mechanical reason contrast with three stage device [2]. Single area framework is more cost-effective and quality prerequisite in the vast majority of the house, shops, work environment are little which can be without trouble met by method for single stage framework. Motor are simple in development, low-evaluated in cost, solid, and advantageous to repair and keep up. Single stage motor utilized as a part of vacuum pump, fans, wet processor, clothes washer, blowers, little toys and so forth.

The single stage AC motor are characterized three composes, for example,

- Single stage offbeat motor
- Single stage synchronous motor
- Recompense motor

The exchanging current begins coursing through the stator or principle winding when single stage AC supply is given to the stator twisting of single stage enlistment motor. This exchanging transition likewise called principle motion it was deliver by substituting current. The EMF gets actuated in the rotor as per the Faraday's law of electromagnetic enlistment. The present begins streaming in the rotor then the current is called as the rotor current on the grounds that the rotor circuit is shut one [6]. Rotor transition is claim motion of rotor current. Since this transition is made because of enlistment standard along these lines, the motor performing on this guideline got its name as acceptance motor and there are two motions one is rotor motion another is called primary motion.

The motor are turned by torque deliver by the two transitions. Capacitor begins and capacitor runs acceptance motor. These capacitor begin capacitor run motor are additionally called as two – esteem capacitor motors. It have both the benefit of changeless capacitor write enlistment motors and capacitor begin compose. Diverse estimation of capacitance for running and beginning because of quality of two capacitor in motor. Between beginning condition high esteem capacitor are utilized and running condition utilized low esteem capacitor.

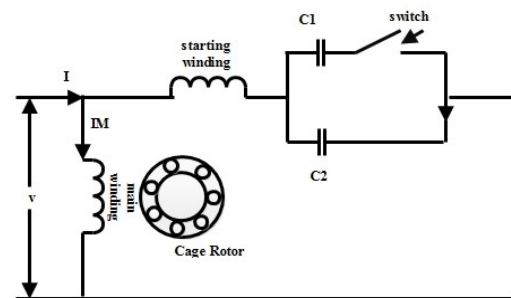


Fig 6. Equivalent Circuit of Capacitor Start Capacitor Run motor

The schematic course of action of this motor is appeared in figure above. At beginning condition, both running and beginning capacitor are associated in arrangement with auxiliary winding. In this way the torque is more contrasted and different kinds of motors. Diffusive switch disengages the beginning capacitor in arrangement with the helper twisting once achieved some speed. Amid running condition both running and assistant windings remain that was enhanced power factor and productivity of the motor [5]. These are the most regularly utilized single stage motor because of better power factor to high beginning torque. These are utilized as a part of compressors, coolers, aeration and cooling systems, transports, roof fans, air circulator, and so on.

V. SIMULATION AND RESULTS

A. Simulation Model of Purposed System

The Simulation consequence of the proposed work talked about for the sunlight based wet processor. This model has three frameworks to be specific, PV board, support converter, inverter, associated with the single stage Induction Motor. Here the IV and PV characteristics of selected Photovoltaic panel are given.

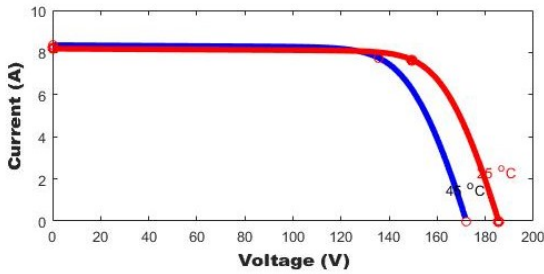


Fig 8. IV characteristics of Photovoltaic panel.

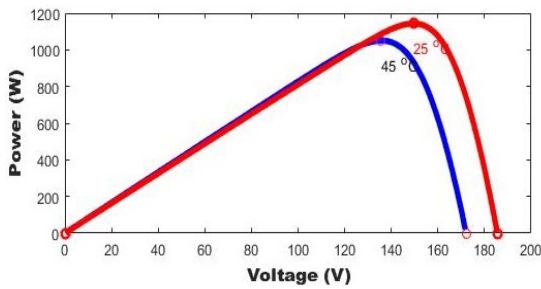


Fig 7. PV Characteristics of Photovoltaic panel.

The boost converter is constructed with the design value of $L= 6.893\text{mH}$, $C=4\mu\text{F}$, and an IGBT switch. The gate for the switch is given by a pulse generator with a frequency of 25kHz and duty ratio of 48%.

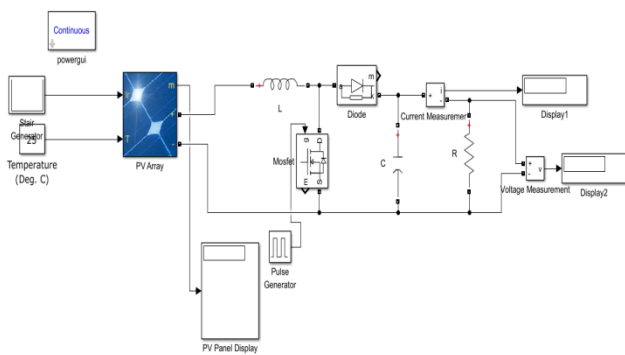


Fig 9. Simulation circuit of Boost with PV Panel

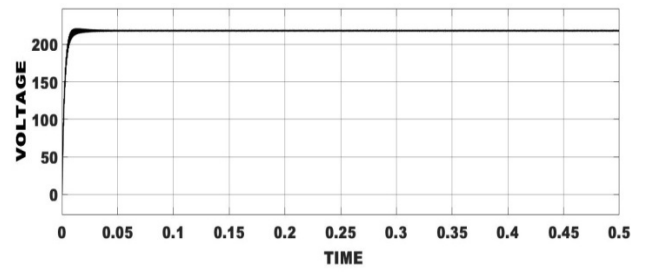


Fig 10. Output voltage of boost converter

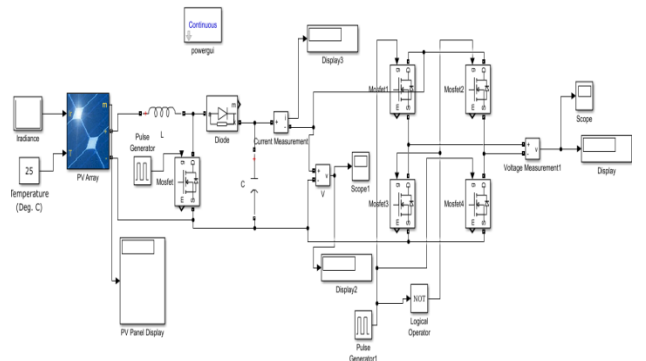


Fig 11. Simulation circuit of Boost with Inverter

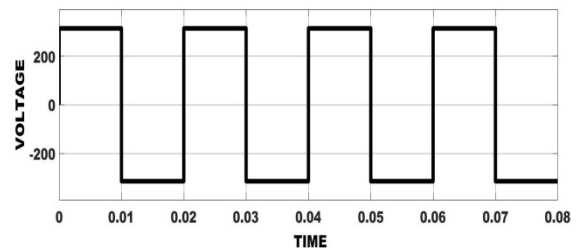


Fig 12. Output waveform of inverter

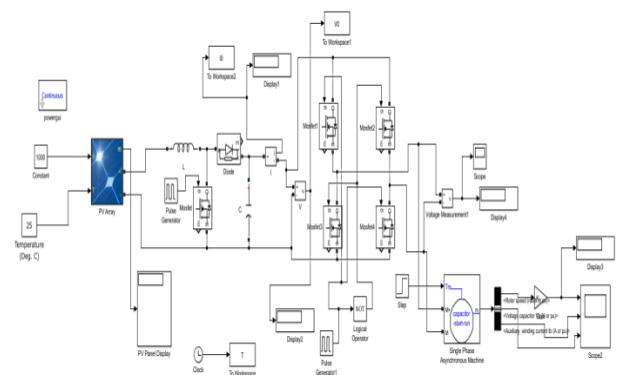


Fig 13. Simulation circuit of Proposed System

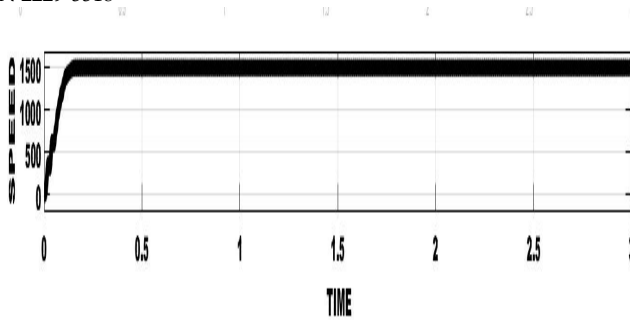


Fig 14. Output waveform of Rotor Speed

VI. CONCLUSION

The proposed model outcome is demonstrated in MATLAB SIMULINK and the yield attributes of photovoltaic is examined effectively. Basically perturb and observe MPPT calculation is utilized to get the most extreme power purpose of solar array exhibition and were boost converter is to acquire extreme power point to advance up the exhibit voltage to the greatest working point voltage. Boost converter solar based array is worked at most extreme power point independent of solar irradiance by utilizing MPPT Algorithm and in advance the inverter circuit which changes over the DC control into AC control and induction motor starts to run associated to grid with the help of inverter outcome.

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