

Simulation And Implementation of Three-Phase Induction Motor drive Quasi-Z-Source Fed Inverter with O & P MPPT

SUNDARI SRAVAN KUMAR

Ph.d SCHOLAR FROM SHRI JAGDISHPRASAD JHABARMAL TIBREWALA UNIVERSITY

Dr. Yerra Sreenivasa Rao

Professor from Department of EEE , Bvsvr Engineering College, Ongole,A.P

ABSTRACT:

This paper proposes utilization of Quasi-Z-source inverter as a solitary stage control change idea for movable speed drives in photovoltaic applications. Sun based board proficiency is low, To track the most extreme power from board, Perturb and Observe (P&O) calculations utilized in Maximum Power Point Tracking (MPPT). Yield Torque-Speed attributes of Induction Machine has been demonstrated and looked at by MATLAB/Simulink programming.

Keywords: PV Array, P&O method, with MPPT state, without MPPT state, Induction Motor (IM)

1. INTRODUCTION

The most ideal approach to use the electric vitality created by the PV exhibit is to convey it to the AC mains specifically, without utilizing battery stockpiling. The nonappearance of fuel cost, clamor, contamination the sun powered vitality source is utilizing for sustainable power source among every single other source. The support cost less. Be that as it may, the PV framework has low productivity due light and temperature. To enhance the proficiency of PV framework, Maximum Power Point Tracking (MPPT) has been produced, for example, P&O, Constant Voltage et cetera. Already dc source will be a supply and capacity to semi Z-source inverter with RL stack. In this paper sun oriented board will be an info source to semi Z-source inverter with MPPT P&O Techniques with Induction engine have been reproduced.

2. Square Diagram

The square chart of by and large PV change utilizing MPPT is appear in figure 1. The created voltage (VPV) and current (IPV) from PV exhibit are contribution for MPPT control. This MPPT control square is figure the reference voltage. By looking at the reference voltage and PV voltage, the exchanging beats (driver signals) produced to switch ON the converter. The converter DC-AC or AC-DC which is relies upon the heap.

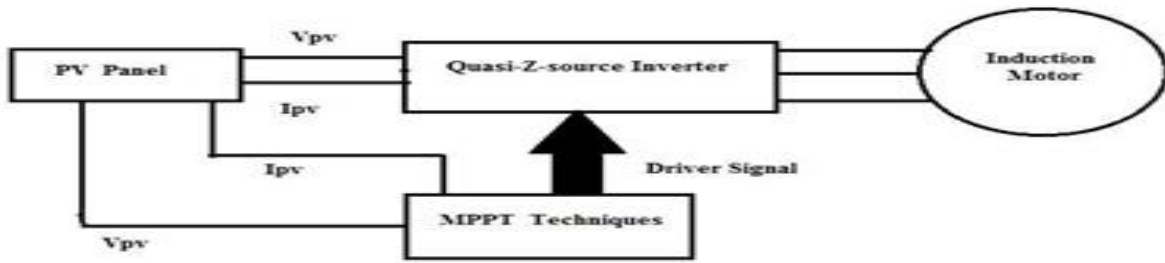


Figure 1: Block diagram of overall PV conversion using MPPT

3. Modelling of PV Array

The equivalent circuit of a PV cell is as shown in Figure 2. Where I_{ph} represents the cell photo current, I_0 represents the diode saturation current, I and V are cell output current and cell output voltage respectively. R_p is shunt resistance. R_s are series resistance. They ideal PV module for one diode circuit.

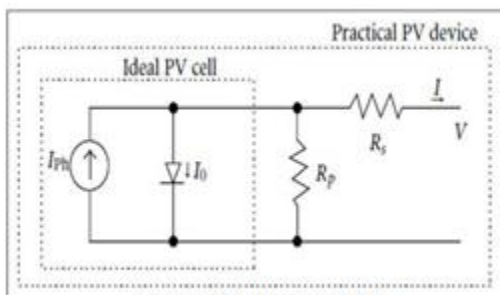


Figure 2: PV cell model

Saturation Current (I_0):

Saturation current of PV system varies with the cell temperature can be determined by given equation.

$$I_0 = I_{rs} * \left(\frac{T}{T_r}\right)^3 * \exp\left[\left(\frac{q * E_{go}}{A * k}\right) * \left(\frac{1}{T_r} - \frac{1}{T}\right)\right] \quad (3)$$

3.4. Output Current (I):

The equation for output current of the PV system of single diode model presented in Figure 1 is given by,

$$I_{pv} = N_p * I_{ph} - N_p * I_0 \left[\exp\left(\frac{q * (V_{pv} + I_{pv} * R_s * R_p)}{N_s * A * k * T}\right) - 1 \right] - \frac{V_{pv} + (I_{pv} * R_s)}{R_{sh}} \quad (4)$$

From the above equations,

I_{sc} is cell's short circuit current(A), K is the temperature coefficient(0.0017A/K), T_c is the operating temperature($^{\circ}C$), T_{ref} is the reference temperature($^{\circ}C$), H is solar isolation (kW/m^2), q is charge of electron ($1.6 \times 10^{-19}C$), V_{oc} is open circuit voltage(V), N_s is number of cells connected in series(36), k is Boltzmann constant($1.38 \times 10^{-23} J/K$), A is ideal factor(1.6), E_{go} is band gap energy(1.1eV), N_p is number of parallel connection of cell(1).

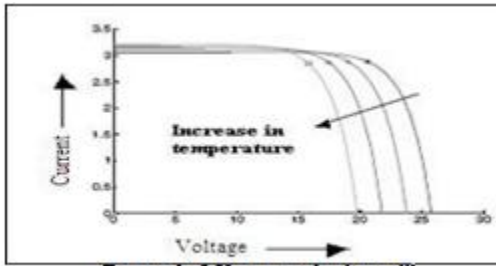


Figure 3: I-V curve of solar cell

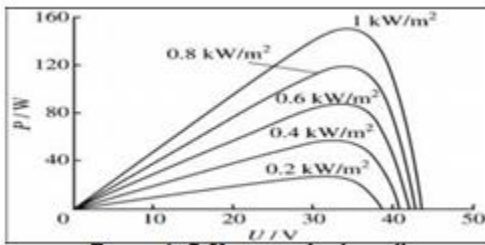


Figure 4: P-V curve of solar cell

In this paper Savitha P B make 178 Wp PV module is taken and the name-plate details are given in Table 1.

Description	Rating
Rated Power	178Wp
Maximum Power Voltage (V_{mp})	26.8 V
Maximum Power Current (I_{mp})	6.64 A
Open Circuit Voltage (V_{OC})	34.2 V
Short Circuit Current (I_{SC})	7.10A

Table 1: electrical characteristics data of Trina solar 178Wp PV module

4. MPPT Algorithm

To enhance productivity of sun oriented board Maximum Power Point Tracking (MPPT) is utilized. It incorporates electronic framework to work the PV modules in a way that enables the modules to create all the power. To track the most extreme power a few strategies are utilized. The most mainstream procedures are Perturb and Observe (P&O), Incremental Conductance(IC), Constant Voltage (CV), Open Circuit Voltage, Neural systems and Fuzzy rationale. Every one of these strategies have their own points of interest and disservices. The decision of the calculation relying upon the execution cost, time, and many-sided quality, proficient to track most extreme power . In this paper Perturb and Observe (P&O) method are utilized with steady and variable obligation cycle separately.

4.1. P&O Method

It is least difficult technique for MPPT to actualize. In this technique yield intensity of sun oriented is checked with the past yield control. In the event that the voltage expanding with control builds then the

obligation cycle D is expanded. For voltage diminishing with control expands obligation cycle D is diminished. The entire process shown as flowchart in Figure 5.

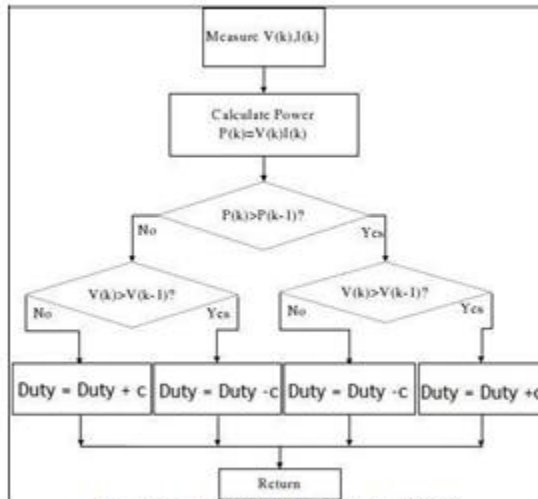


Figure 5: Flow Chart of P&O MPPT

5. Induction Motor

An electric engine is a gadget which changes over an electrical vitality into mechanical vitality. This mechanical vitality at that point can be provided to different kinds of load. As air conditioning supply is usually accessible. The air conditioner engines are named single and three stage enlistment engines, synchronous engines and some exceptional reason engines. The essential points of interest of three stage enlistment engines over different kinds are self-beginning property, no need of beginning gadget, higher power factor, great speed control and vigorous development. There are two sorts of rotor developments which are utilized for acceptance engines are,

Squirrel confine rotor and

Slip ring or Wound rotor.

Here we utilized in Squirrel confine enlistment engine and its execution can be examined through in MATLAB/Simulink.

6. Reproduction Results

The reproduction of MPPT methods was done and plotted diagram for enlistment engine with and without organize execution and the mimicked circuits.



Figure 6: Simulation of Quasi-Z-source Inverter with P&O MPPT technique



Figure 7: Simulation result of Quasi-Z-source Inverter with P&O MPPT technique output



Figure 8: Simulation of Quasi-Z-source Inverter with P&O MPPT method and Induction Motor

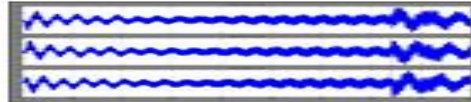


Figure 9: Simulation result of Quasi-Z-source Inverter with P&O MPPT method and Induction Motor motor output

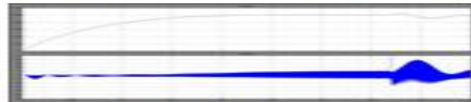


Figure 10: Simulation result of Quasi-Z-source Inverter with P&O MPPT method and Induction Motor mechanical output

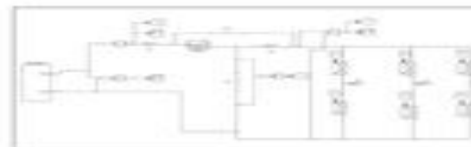


Figure 11: Simulation of Quasi-Z-source Inverter without P&O MPPT technique

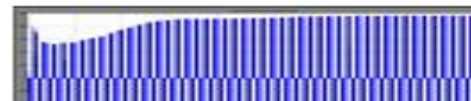


Figure 12: Simulation result of Quasi-Z-source Inverter without P&O MPPT technique

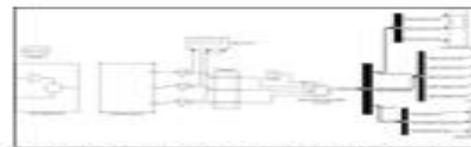


Figure 13: Simulation of Quasi-Z-source Inverter without P&O MPPT method and Induction Motor



Figure 14: Simulation result of Quasi-Z-source Inverter without P&O MPPT method and Induction Motor motor output



Figure 15: Simulation result of Quasi-Z-source Inverter with P&O MPPT method and Induction Motor mechanical output

7. Conclusion



In this paper, analysed the performance of Quasi-Z-source inverters in with and without P&O MPPT techniques in Induction Motor and the simulation designs are simulated using MATLAB/Simulink.

8. References

1. " Modeling of 250WP Photovoltaic Module and its Performance analysis using MATLAB/Simulink", Savith.P.B., Proceedings of IRF Journal Conference, 23rd March 2014.
2. "An energy stored Quasi-Z-source inverter using SVPWM Techniques", Dhanya.k.Thomas., International Journal of Electrical Research., Vol.2,Issue.7,July 2014.
3. "Modelling oh solar power based Quasi-Z-source inverter to supply BLDC Motor", Neethu Johnson., International Journal of Electrical Research and Innovative., Vol.2, Issue.2, Feb-2014.
4. "Comparative study of P&O and Incremental Conduction MPPT Algorithms", I.William Christopher., AJER., Vol.2,Issue.12,2013.
5. "Three stage cascaded Quasi-Z-source inverter system for Renewable applications", Nisha.K.C.R., International Journal of Electrical Research, Vol.3, Issue.5, July 2013.
6. "A Comparison of Two MPPT Techniques for PV System in MATLAB/Simulink", Sangita s. Kondawar., IJERD., Vol.2, Issue.7, Aug 2013.
7. "Digital simulation of current-fed Quasi-Z-source inverter", Kishor.G., International Journal of Electrical Research., Vol.3, Issue.4, aug 2013.
8. "Power Conditioning System for a grid connected PV Power generation using a Quasi-Z-source inverter", Jong-Hysung Park., Journal of Power Electronics., Vol.10, No.1, Jan 2010.
9. "Analysis of sinusoidal Pulse with modulation control strategies for Quasi-Z-source inverter.", Jani Das., International Journal of Electrical Research., Vol.2,Issue.9,Sep 2013.
10. "Photo voltaic Power injected to the grid with Quasi-Z-source inverter", Gobi.M., International Journal of Electrical Research, Vol.2, Issue.3, May 2014.
11. "Closed loop controlled solar cell Power embedded EZ-source inverter fed induction motor drives", Nisha.K.C.R., ACJEE., International Journal of Control System and Instrumentations., Vol.4,Issue.2,June 2013.