

INDUCTION MOTOR DRIVE USING BOOST CONVERTER AND INVERTER FED FROM PHOTOVOLTAIC PANEL

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ABSTRACT

This paper presents a topology of induction motor which drives system desegregation, a lift convertor and a IGBT inverter victimization solar photovoltaic panel. The motor is driven with the offered power at the instant. To match resistivity between the solar array and motor load and to improve the panel voltage, a lift dc-dc convertor topology is used, maximum power point pursuit rule is enforced to extract most power from the PV panel. A three level inverter is employed to drive the induction motor. We tend to use IGBT clamped inverter. The proposed system is simulated in matlab and results are mentioned.

KEYWORDS: Incremental Conductance, MPPT Maximum Power Point Tracking, PV Panel

INTRODUCTION

The power device plays a very important role within the PV fed drive system for the development of potency. The most electric outlet following is use to extract maximum power from the PV panel [1]. There are over thirty algorithms to trace most wall socket. MPPT algorithmic rule is use so as to match load aspect electric resistance with supply, thus power flow is most. Incremental conductance rule is employed within the paper [2-3], completely different duty cycles are calculated from the rule with varied irradiation.

The pulses are generated from corresponding duty cycles, that is given to a DC-DC device. There are various types of DC-DC converters. Boost DC-DC device is most ordinarily used [3]. Here we have also used the same.

Sinusoidal pulse width (SPWM) modulation is often employed in the electrical converter switch, since it is easiest and effective way to control inverter output to be fed to ac instruments.

Here an induction motor is driven through three phase inverter and Boost DC-DC converter. Induction motor is that the most well liked motor within the market. The projected system is often used for water pumping, and alternative drive system.

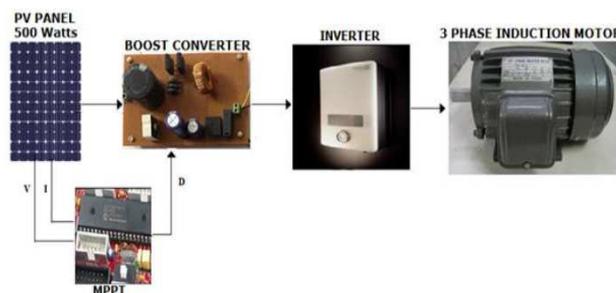


Figure 1: Overall Block Diagram

LITEARTURE SURVEY

Photovoltaic power provides an atmosphere friendly green supply of electricity, of that the fuel is sunshine, a renewable energy. Power physical science interface like dc-dc device merge with a dc-ac three-phase electrical converter, it's potential to transfer the facility expeditiously from the panel to the machine useable curved ac with the assistance of most wall plug trailing (MPPT), wherever MPPT works by dynamic the parameters of the facility physical science parts so as to get the most power accessible at that moment of the panel. Pulse breadth Modulation (PWM) technique is employed for electrical converter shift and dominant of induction motor, but these techniques suffers from many drawbacks like low elementary output voltage, excessive quantity of harmonic part, and better price of Total harmonic Distortion (THD), that is harmful and ensuing poor performance of induction motor. to beat this downside a 3 level electrical converter is employed here.

MODELING OF PHOTOVOLTIC SYSTEM

A photovoltaic cell is largely a semiconductor, contact invented in an exceedingly skinny wafer of semiconductor that converts natural light into electricity. The electromagnetic wave of solar power is directly reborn to electricity through photovoltaic phenomenon. The ability on the PV depends on sun irradiance, panel temperature and operation voltage and current. The current-voltage relationship is termed as I-V characteristic that may be a complex and non linear performance function [5-6].

Figure 2 Shows the Equivalent Diagram of A PV Cell.

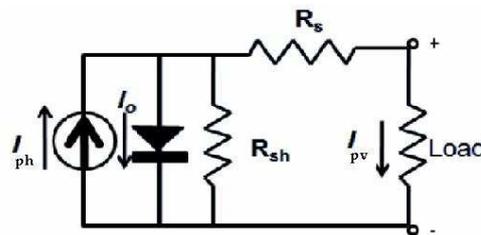


Figure 2: Equivalent Model of a PV Cell

PV cells are sorted in larger units referred to as PV modules that are interconnected in a parallel-series configuration to make PV arrays. The electrical photovoltaic panel is sculptured as per the mathematically equation given below. Eqn (4) provides the PV module current output IPV. Required quantity of Power is generated by connecting PV panels in combination of series and parallel.

MPPT is an algorithmic rule to search out the utmost outlet of the PV panel at totally different irradiation. Since the P-V curve of the solar array is non linear, once variable load like motor is connected to the system, it's not necessary that the load can absorb most power from the solar array. As per most Power Transfer theorem, the output power flow is most between supply to load facet once the Theven in resistivity of the source matches with the load resistivity. This matching of resistivity is completed victimization the MPPT algorithm.

INCRIMENTAL CONDUCTANCE MPPT ALGORITHM

This method exploits the assumption of the ratio of change in output conductance is equal to the negative output Conductance Instantaneous. We have,

$$P = V \cdot I$$

Applying the chain rule for the derivative of products yield

At MPP, as $\partial P / \partial V = 0$

$$\partial I / \partial V + I / V = 0$$

$$\text{or } \partial I / \partial V = -I / V$$

The MPPT regulates the PWM control signal of the dc –to –dc boost converter until the condition: $(\partial I / \partial V) +$

In this method the peak power of the module lies at above 98% of its incremental conductance. The Flow chart of incremental conductance MPPT is shown below

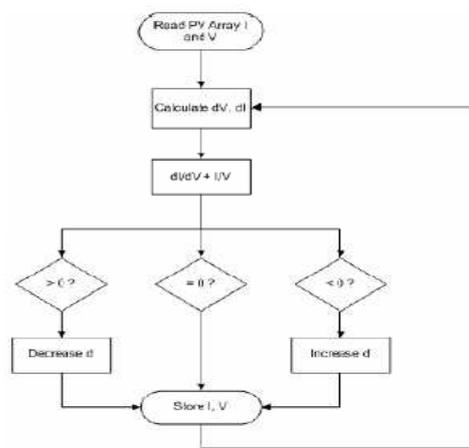


Figure 3: Incremental Conductance MPPT Flow Chart

BOOST CONVERTER

The boost may be referred to as improve DC-DC convertor since its output voltage is stepped to a better price. to realize MPPT of the PV panel, the dc-dc boost convertor topology is employed. the pulse generated from the MPPT algorithmic rule is fed to the switch of the convertor. Therefore the ohmic resistance between the availability supply facet and load facet is unbroken equal, thus most power flow happens.

Boost circuit accommodates a electrical device, high frequency switch MOSFET, diode and a filter across load.

The relation between the load and provide voltages are shown below:

$$V_o = V_s / (1-D)$$

$$D = T_{on} / T$$

Where V_o —Load voltage, V_s Supply voltage

The output voltage of the boost convertor depends on the supply voltage and duty cycle.

Where V_o —Load voltage, V_s Supply voltage, D = Duty cycle , T_{on} = Total time interval.

IGBT INVERTER

Three level diode clamped electrical convertor consists of twelve switches and 6 quick recovery diodes with 2 dc-

link capacitors. To supply n levels of section voltage, an n level diode clamped electrical converter desires $(n-1)$ capacitors on the dc bus.

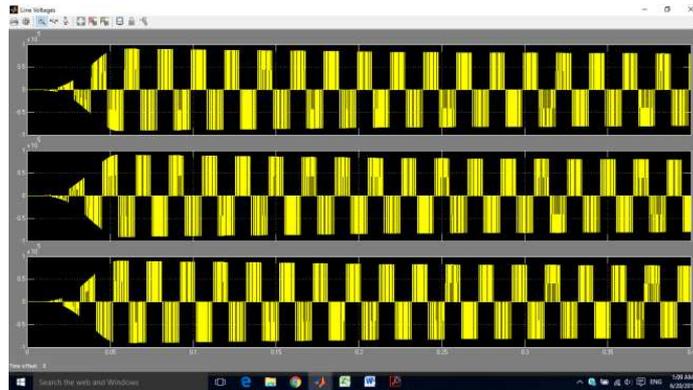


Figure 4: IGBT Inverter

The curved PWM technique is fashionable in industrial converters. The final principle of pulse generation, wherever an triangle of carrier of frequency f_c is compared with the basic frequency of the curved modulating wave, the purpose of intersection confirm the change point of the IGBT.

In this SPWM technique sine wave is taken as the modulating signal (50Hz) and it is compared with the two high frequency carrier signals (4KHz) and the resultant gate pulse is produced which is given to the corresponding switches of the inverter to produce the three level waveform.

INDUCTION MOTOR

Induction motor is one of the every foremost ordinarily used motor. Concerning ninety percent motor made in market is induction motor and further its price is moderate. The synchronous speed of the motor has been controlled by controlling the frequency of the stator voltage.

SIMULATION RESULTS

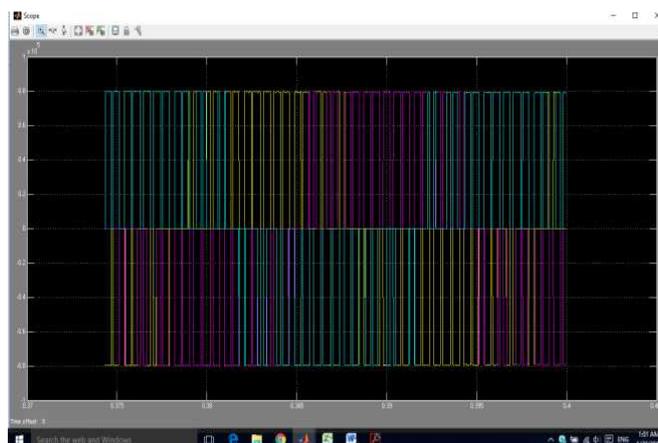


Figure 5: Shows the MATLAB Model Output of Inverter after Boost Converter

The figure.5 shows the MATLAB model of boost converter with solar panel. Output voltage of the DC-DC converter with respect to the change in irradiation

As irradiation increases, the output voltage increases.

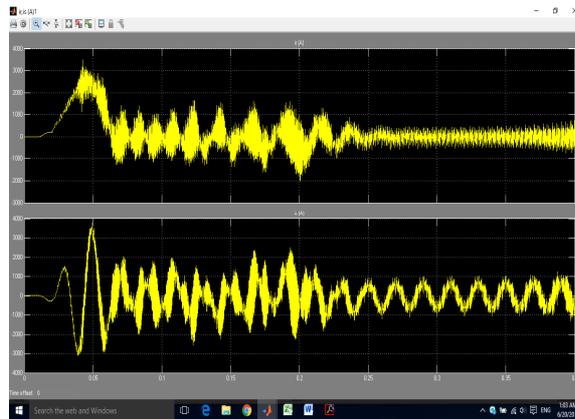


Figure 6: Stator and Rotor Current of Induction Motor

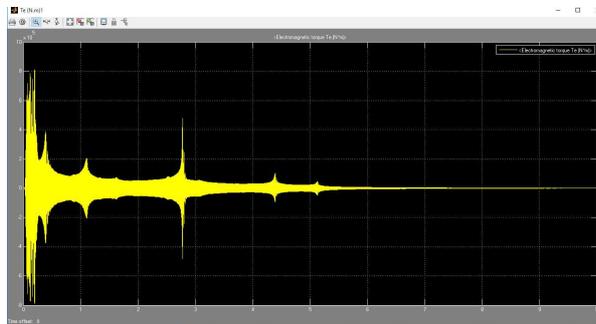


Figure 7: Shows the Torque a Wave form of Induction Motor

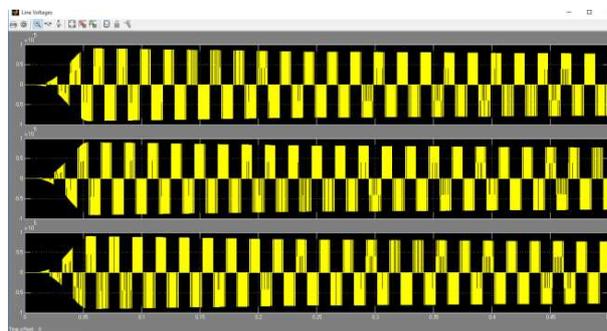


Figure 8: Output of Inverter Showing Line Voltage

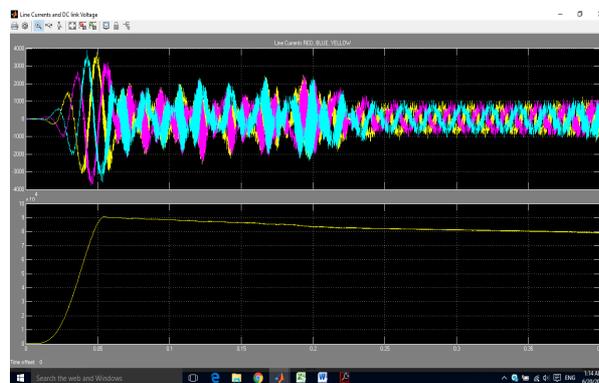


Figure 9: Shows the Three Phase Line Currents and Dc Link Voltage of Inverter

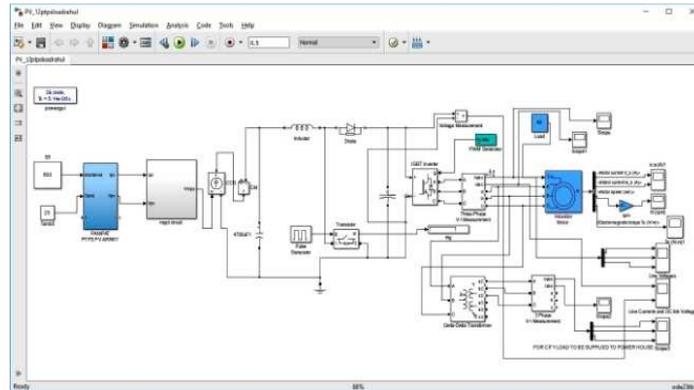


Figure 10: Overall MATLAB Model

Here motor is loaded to 6Nm at 1 sec. As the loading is done, the speed of the motor reduces.

CONCLUSIONS

The simulations are applied in MATLAB and results are studied. The progressive algorithm is enforced for extracting the utmost power from the PV panel. A DC-DC converter is employed to match the electric resistance between the load and supply. The matching of the electric resistance of each aspect helps in achieving the utmost power flow. Here is an IGBT inverter driving the induction motor.

FUTURE SCOPE

In this paper PV array fed to 3 phase induction motor through IGBT electrical inverter and boost converter. In future we are going to work on different forms of load and electrical converter. Therefore we are able to say that there is a large scope of pv array fed induction drives as an example we can apply in railway system rails as we all know that railway system trains also run on induction drives (for example DMRC DELHI). Further at Ballabhgarh metro railway station (DMRC) we have got complete electricity offer through pv panels.

Further it lays stress for native pv plants as an example one that is planned in HPGCL PTPS Panipat (proposed at 10 MW) for domestic supply in city and nearby villages whose land has been acquired by HPGCL (Panipat).

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