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Simulation of Solar cell Based Multilevel Inverter for Induction Motor Applications

Karanam Deepak[1], DR M Rama Prasad Reddy[2], U Chaithanya[3], Y Hazarathaiah [4]

[1,4] Assistant Professor, [2,3] Professor

Department of Electrical & Electronics Engineering, G. Pullaiah College of Engineering and Technology (GPCET), KURNOOL, Andhra Pradesh, India.

ABSTRACT

The RES systems like wind Renewable energy sources, solar Renewable energy sources along with Energy obtained from water source are observed as a dependable substitute to the Existing energy resources like oil, natural gas and coal. Distributed Electrical Transmission method is depended on RES undergoes large scale growth across the world. As a Result, the control of distribution generation scheme should be enhanced to satisfy the necessities for grid interconnection. This paper explains the growth of a control design in favor of grid tied inverters of RES. In this proposed concept HCC controller is used as a controller of the system. In the proposed controller the inverter with Induction Motor drive Load current is essential towards the allow the grid connected voltage in provisions of the regular intervals of the time. The Ig is calculated, along with contrasted through the Ir is in form of the unit sine waveform attained as of the grid along with the sine-pulses are produces the error among the authentic current and the grid of Load current. And the delivered power of the grid is increased as the Direct Current linkage of the voltage also increases. The converter will be experienced on grid interface on the rotor surface of an induction Motor generator. The Proposed technique is fed to a induction motor drive as well as the shows the motor speed characteristics, Torque characteristics and Stator Current characteristics is analyzed by using Matlab/Simulink software.

Keywords
Renewable energy sources (RES), Hysteresis Current Control (HCC), Distribution Network, Induction Generator, Reactive Power, Harmonics, and Power Quality.

I. INTRODUCTION

In the last few years, Inverters (MLI's) has gain consideration due towards the broad appliance in distributed systems along with the Industrial Motor drives. The improved sinusoidal sine waveform of the ac output commencing dc resources similar to batteries, Photovoltaic cells. Etc is to be attaining from Multi-Level Inverters. In the ac output be able to directly interface towards the load through the little filter circuits is in the output [1].

In the stairway waveforms are able to produce from several input DC supply feed toward a Multi-Level Inverters. Multi-Level Inverters' stair waveforms depict an improved harmonic report. The main limits of Multi-Level Inverters are constraints of huge No. of Switches are used along with connected driver circuits. Now a day's Electricity is widely used in everywhere in the world. So the applicants are want to be used Quality Power. There are several types of energy's are available in the world. Electricity is the basic need of the people, which is used as household purposes, industrial applications and Domestic applications. Renewable Energy sources are used for generation of the Electricity because of Free Environment and for future generations. In solar Photovoltaic method is one of the finest techniques is to produce Electricity. In recent developments photovoltaic (solar) has to be delivering the constant power than moreover entity supply.

In Distribution systems, the supply of the primary consumers is to be resolved with the economical conditions, eco-friendly, improvement of Power quality and the high reliability conditions. So in this paper we developed a generation system with the combination of fuel cells, solar cell and also backup with the battery Banks. And the definition of the generating systems in distributed Generation is a supply of little electrical power is linked to a network or circuit. Industrial development now allows Electrical power system to be built in less essential amount through far above the ground efficiency, economical, and Eco-friendly. In the Electrical Power electronics have misused quickly through the last thirty years as well as the number of requests has been rising, essentially suitable toward the growth of the semiconductor devices as well as the microprocessor. A summary of dissimilar power strategies as well as the region where the expansion is still obtainable on is shown in Figure.1 [1]. The fed of the voltage source converter drives are

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the majority commonly use in low as well as medium power applications, but not used widely in high power functions. Now days, current source converter fed drive motors are increasingly used for average voltage high-power application anywhere quick dynamic response is not required because of the subsequent compensations [2-8]:

- Easy converter technology,
- Intrinsic four quadrants process,
- High Reliability,
- Motor responsive waveforms through low rating of dv/dt.

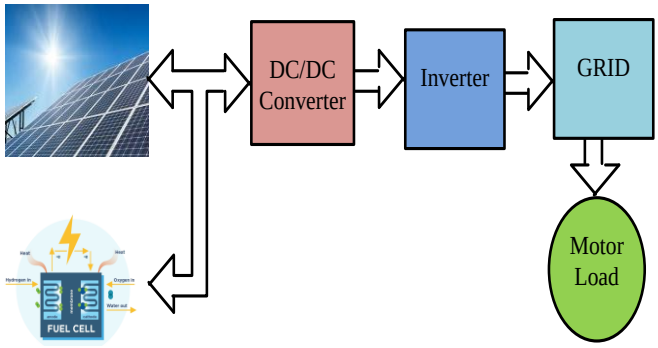

Fig.1. Hybrid Energy system with Inverter

II. PROPOSED SYSTEM WITH INDUCTION MOTOR DRIVES

In our proposed control strategy the Solar Based Photovoltaic Cell is Connected to DC/DC converter is to get desired level of DC Voltage and is to a voltage source converter. If the Solar Based Photovoltaic Cell generate with AC voltage is to be connected Voltage source converter following convert it. And they also DC link capacitor is isolates connecting the both rectifier as well as the inverters, as long as the independence for the proposed control of mutual the both the converters. The power as of several of the fewer steady Solar Based Photovoltaic Cell are to be supposed the conditioned prior to relating them to the Voltage source inverter. The DC voltage link move the power from the Solar Based Photovoltaic Cell to the grid connected systems. The control method of the proposed system is as shown in Figure 2.

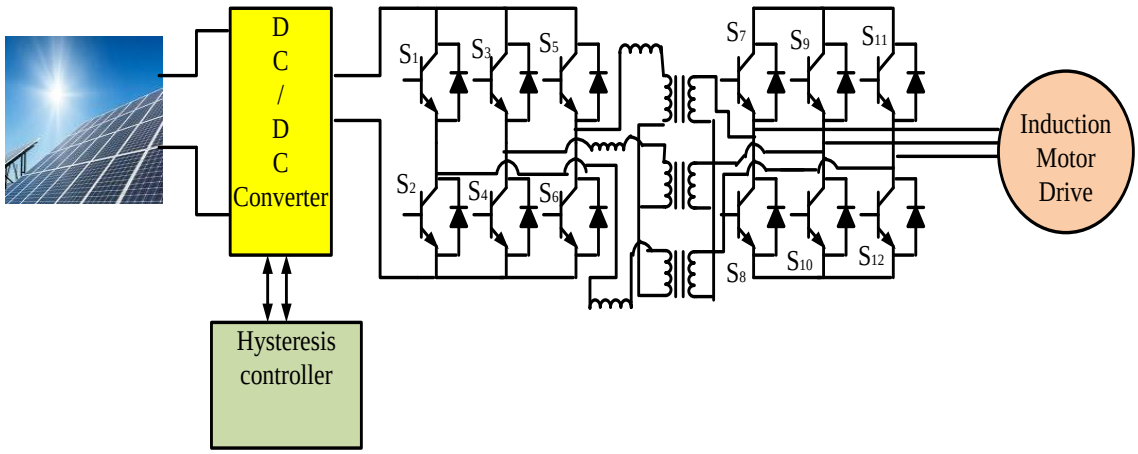

Figure 2. Block Diagram of Proposed Control System with PV supply

The output current of the inverter, in this Proposed Control systems, is required to track the V_G. The V_G (grid Side voltage) is changed towards a Desired Level by a unity sine wave generator along with this waveform is used as the Current-reference. The definite grid current is calculated and evaluate with the Current-reference, which is the unit sine wave acquire from the grid side of the proposed system, in addition to the pulse are generate according to the error connecting the definite current and the grid current. The Singe vector patterns are attain from the grid side voltage, and the synchronize

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angle position, is the 3-Φ is used to power of the inverter output current to follows to grid voltage. The voltage Phase vector differences are correspond to the

$Va=Sin(\Theta)$ (1)

$Va=Sin(\Theta-2\Pi/3)$ (2)

$Va=Sin(\Theta-4\Pi/3)$ (2)

These Voltages Phase Differences of the Each phase is 120^0 are sampled and fed to the hysteresis controller and evaluate with the definite grid currents la , Ib and Ic sample as of the grid straightly.

In ON Condition of the Three phase controller is to satisfy the below Equations are

$Ia \geq (Va+Ң)$

$Ib \geq (Vb+Ң)$

$Ic \geq (Vc+Ң)$ (3)

Where, h is the hysteresis Control Variable In ON Condition of the Three phase controller is to satisfy the below Equations are

$Ia \geq (Va+Ң)$

$Ib \geq (Vb+Ң)$

$Ic \geq (Vc+Ң)$ (4)

In the position of the Solar Based System to the grid and the level, the frequency and the phase difference of the voltages on the both sides must equal. The reference current is provided from the grid Side of the voltage. This facilitate the control system to produce switching pulses for the inverter such that the inverter output current is in the similar phase as well as frequency as that of the grid side voltage. separately as of the Grid-synchronization, And the inverter side of the output voltage be supposed to lead the grid voltage in regulate to attain power transferring from the Photovoltaic Cell to the grid. The Proposed control system is the inverter side of the output current is same phase as that of the grid current and also lags the inverter voltage based on the angle of the inductance in the Proposed System.

The inverter side of the output voltage lead to the grid side voltage by the similar angle phase difference. The Control System with PV supply with these (4) & (5) equations therefore provide switching pulses in the direction of the inverter in the inverter output side current is required to pursue the reference side current severely.

The Ac supply is to converts by using the converter of the Proposed System in figure 2. And the input of the inverter is output of the DC-DC Converter. So Dc voltage is input of the Converter and Output AC is connected to the Induction Drive For Industrial Applications. And the Entire proposed system is Designed by using MatLab-Simulink Software to get the output wave form of the circuit.

III. SIMULATION RESULT ANALYSIS

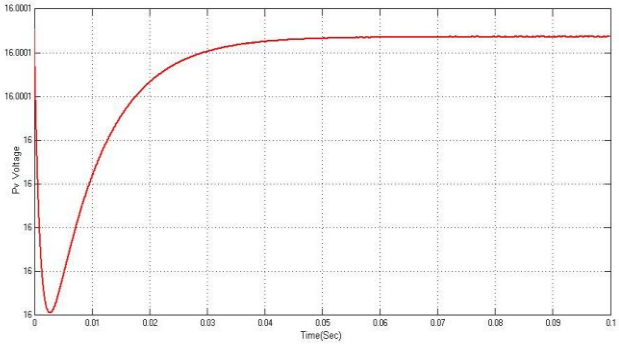

Figure 3 Simulation Result Of the applied solar based photovoltaic cell applied Input voltage

Figure 3 shows the Simulation Result Of the applied solar based photovoltaic cell applied Input voltage.

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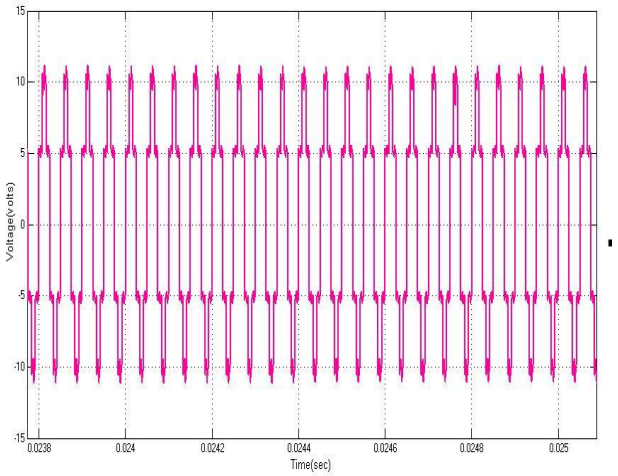

Figure 4 Simulation Result of the Grid connected inverter output Voltage

Figure 4 shows the Simulation Result of the Grid connected inverter output Voltage. The above Wave form is the output of the grid connected inverter based Induction Motor it is nearly12Volts so in output we get 120volts because we used auto Transformer to boost up the output voltage of the inverter.

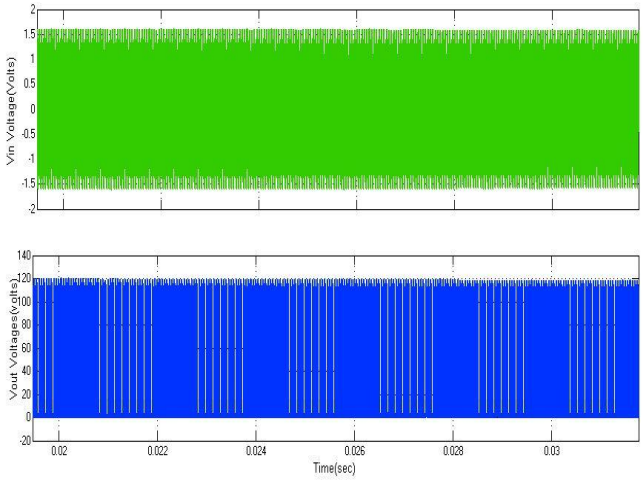

Figure 5 Simulation Result of the both input and output of the Grid connected based inverter with Induction Motor Drive

Figure 5 shows the Simulation Result of the Grid connected inverter input & output Voltage. The above Wave form is the output of the grid connected inverter based Induction Motor it is nearly12Volts so in output we get 120volts because we used auto Transformer to boost up the output voltage of the inverter.

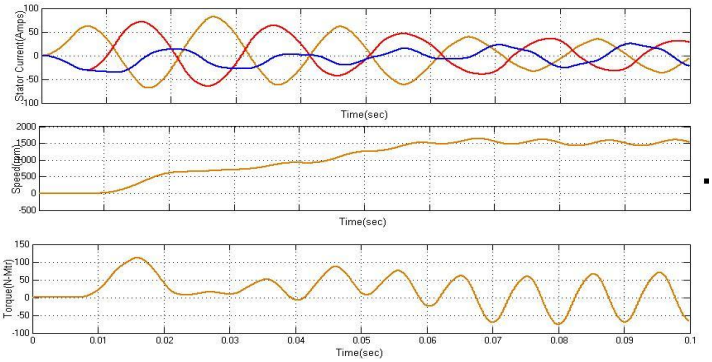

Fig.15 Simulation waveform for Stator Current, Speed, and Torque for Induction Motor

Figure 5 shows the Simulation waveform for Stator Current, Speed, and Torque for Induction Motor of the Proposed Grid connected two Level Multi Level Inverter

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VI. CONCLUSION

In this paper Implementation of Multi-Level Converter Based Induction Motor Drive for Industrial Applications. This paper explained the growth of a control design in favor of grid tied inverters of Solar Based PV Cell and the Hysteresis Current Controller is calculated in this module. In the proposed controller the inverter with Induction Motor drive output current is essential to allow the grid voltage in provisions of the regular intervals of the time. The proposed circuit is connected to the Induction Motor Drive and test the performance of proposed system. Simulation results are shown by using Matlab/Simulink software.

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