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Survey on Power Factor Correction in both Multilevel Inverter and Voltage Source Inverter

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Abstract: The analysis of voltage source inverter and multilevel inverter based on grid connected system. The cascaded H bridge multilevel inverter has improved the performance of grid connected system such as high power factor, less total harmonic distortion. The dc –dc converter fed grid connected system. The high switching frequency has utilized to decrease the switching losses. The voltage source inverter has utilized less passive elements compared to multilevel inverter. The PV based converter system has utilize both voltage source and multilevel inverter. The comparison of voltage source inverter and multilevel inverter of power factor and harmonic distortion is designed and implemented in MATLAB/Simulink environment.

Keywords: Photovoltaic (PV), Voltage Source Inverter (VSI), Multilevel Inverter (MLI), power factor correction.

I. INTRODUCTION

The photovoltaic based grid connected system has designed both voltage source and multilevel inverter. The cascaded multilevel inverter has used in medium voltage application and enhance the total power capacity. The converter has used to improve the voltage and decrease the losses. The most imperative device in the structure associated PV framework is the inverter [1-3]. As indicated by the association of PV inverters to framework, four kinds of topologies are conceivable. These are: unified inverter topology, string inverter topology, multistring inverter topology and AC module topology [4-5]. They have points of interest and drawbacks over the others. Alternating current module topology is the most private and has the best MPPT capacity, since one converter is utilized per module. This topology will evacuate the mixture between PV modules since there is just a single PV module [6-7]. This kind of topologies is simple to extend just by adding one PV module associated with one converter. This AC module topology will be utilized as a part of the proposed framework in this paper [8]. Cascaded MLI highlights has picked up an alluring answer for numerous applications, for example, utilize CHB MLI in independent frameworks, a portion of the in static VAR pay, some of them utilize CHB MLI in lattice associated PV framework [9].

Voltage Source Inverter

The three phase voltage source inverter has six switches and generates the alternating voltage across each leg. In each leg both switch are not simultaneously switched on. The voltage source inverter has classified on the basis of frequency, voltage and harmonics [10]. The circuit diagram of three phase inverter is shown in fig 1.

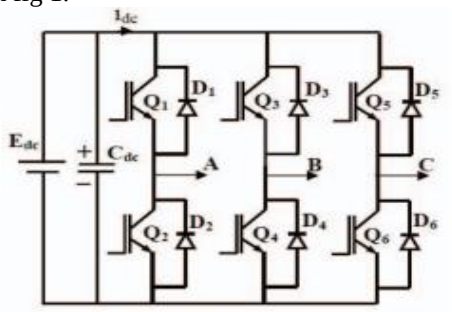

Fig 1: Voltage Source Inverter

The voltage source inverter has contained some ripple at the output waveform. The voltage is not pure sinusoidal with some distortion. The three switches are on for particular period and remaining switch is off. The output voltage and current is depends on the switching pulse. The pulse width modulation has reduced the ripple by decreasing the frequency harmonics. The power factor correction and total harmonic distortion is shown in Fig 2 and 3.

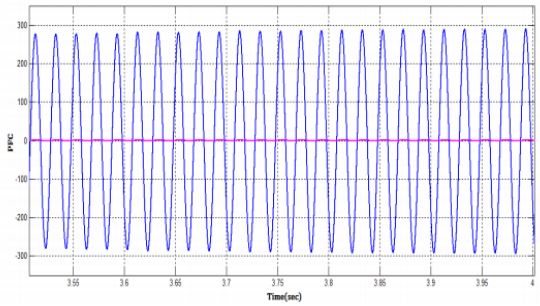

Fig 2: Power Factor Correction

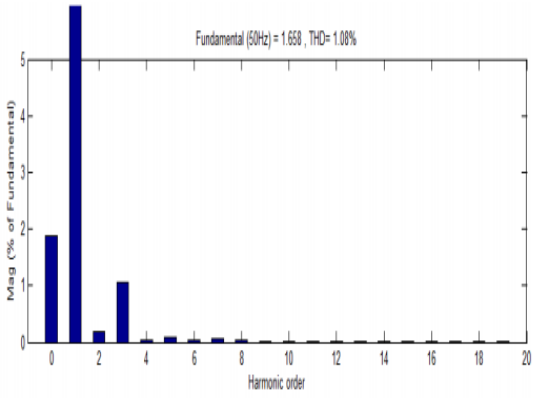

Fig 3: Total Harmonic Distortion

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The linear load based voltage source inverter has enhanced the power quality. The power factor correction is attained 0.86 and total harmonic distortion is 1.08%.

Multilevel Inverter

In multilevel inverter generate high output voltage from medium voltage source. This inverter consist of various switches and important to arrange the switches. The diode clamped utilizes the diode and give different voltage level by connecting series capacitor to the inverter circuit. The diode has transferred the limited voltage for decreasing the stress. In diode clamped the switches, diodes and capacitor is high. The cascaded H Bridge multiple inverters use the minimum number of capacitors and switches in each level. This inverter has less weight and eliminates the transformer in inverter circuit.

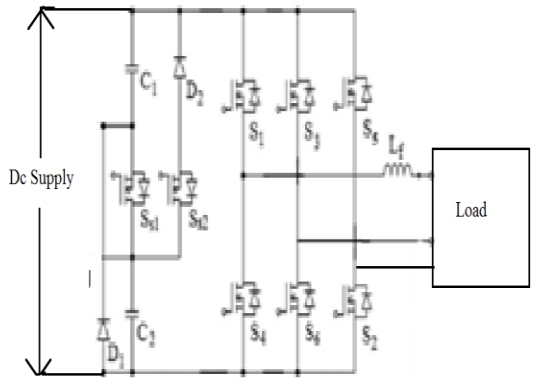

Fig 4: Multilevel Inverter

The seven-level inverter of the output current is related at positive half cycle of the general condition. The operating principle of the seven-level inverter contains in the positive half cycle of the utility side. The seven level inverter waveform is shown in fig 5.

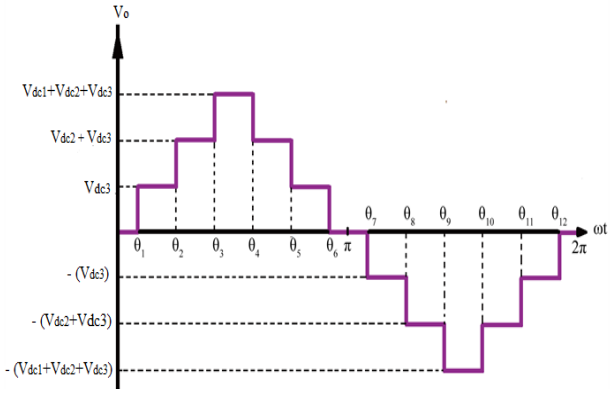

Fig 5: Seven Level Waveform

First level of the output voltage is advanced than the utility voltage used to amplify the filter inductor current and similarly the next level of the output voltage is lesser than the utility voltage, while in order to lessen the inductor filters current. Because of only one power semiconductor electronic switch is varied at high frequency at any time to give the output of seven-level voltage, while the performance of switching power loss is reduced and improved power efficiency.

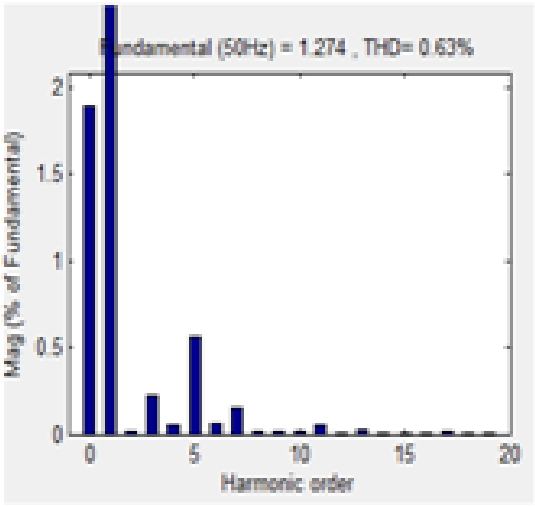

Fig 6: Total Harmonic Distortion

The power factor correction is attained 0.91 and reduces the total harmonic distortion is 0.63 compared to voltage source inverter.

II. CONCLUSION

The comparison of three phase voltage source inverter and cascaded H Bridge based seven level inverter is analyzed and attained the high output voltage, less harmonic distortion and high power factor correction. The PV based grid connected system has enhanced the output voltage. The simulation results have increasing the power quality at the grid side and efficiency. The minimum passive elements are used in multilevel inverter compared to voltage source inverter.

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