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Multilevel Inverter for Pv System

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ABSTRACT : This paper presents a multilevel inverter for PV system. The main purpose of this paper to design a grid tied solar Photovoltaic system using dual cascaded multilevel inverter. To extract maximum power from solar photovoltaic system, individual maximum power point tracking technique used for simulink the simulation model has been developed.

KEY WORDS : Multilevel inverter, MPPT, PV System, PI current controller, Dual reference PWM.

I. INTRODUCTION :

Non Conventional energy sources have become a great necessity of today's era. This is because non-renewable energy sources are highly exhaustible. Also these energy sources will describe very soon in the future. Among these renewable energy sources solar photovoltaic is one of the most importance renewable energy sources compared to other non conventional energy sources. Solar photovoltaic energy sources are getting ever important with the current drive towards environmental and sustainable eco-friendly technique of power generation. In this tomorrow ongoing revolution a huge part plays by solar photovoltaic power generation. Hence; for electric power generation, solar photovoltaic energy is considered a very most promising source of power generation. Now to technologies which are widely used now a days to provide power are either for connection to the power grid system or stand alone loads. In order to meet the load demand, solar photovoltaic grid connected system are now being used. Because, a standalone solar photovoltaic energy system cannot provide a continuous energy supply due to periodic variations and seasonal variations.

Different inverter structures are used to increase the efficiency and improve the inverter ratings. Inverter are the power electronic devices consisting of a number of switching elements, which are connected proper switching sequences. The Inverter can produce AC output from a DC input battery supply. By using added switching devices rated high enough to withstand the considerable required output by using this multilevel inverter (MLI).

To reduce the total harmonic distortion (THD) in the ac output supply, the switching pulses are generated through on pulse width modulation technique. 5 level design is selected here as it offers both less circuit complexity and less total harmonic distortion. A 5 Level three phase inverter employed with 6 switches and used sinusoidal pulse width modulation techniques for switching are proposed here. It was implemented in hardware Digital signal processor (DSP) and was used for STATCOM application. DSP TMS320F28335 used as the controller.

To create the voltage as a combination of individual battery cells are connected in series to obtain multilevel voltage levels with low numbers of switching elements through intelligent modified connection of the cells.

Advantages of reduced switched MLI

i) Less Occupancy space
ii) Low cost
iii) Reduced component
iv) Highly effectiveness
v) Compact circuits

Cascaded Multilevel Inverter

To prevent the use of Inductors a cascaded H bridge multilevel Inverter following by a boost inverter. Here capacitors are used as voltage sources with a single source of Direct current (DC).

DESIGN EMPLOYED :

6 Switches for getting a 5 level alternating current (AC) output. This inverter with five levels was used for electric vehicle application in different ways. A 100 Volts and 180 Amperes rated MOSFET used in hardware for design implementation with FPGA alternative field programmable gate array in the controller.

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Cascaded H-Bridge Multilevle Inverter

The inverter is primarily used to convert direct current input voltage into alternative current output voltage. In this alternating current output, both frequency and amplitude varied or both maintained at a constant levels.

Since inverter outputs are not generally ideal sine waves due to harmonics, which are generated primarily. This is due to the nonlinear behaviour of machine cores and power electronic devices used in the inverter. If a single DC source, Vs is used in such an inverter with 'n' number of levels, then the voltage for each level VO as

i) Vo = Vs/n-1

ii) $\alpha i = i\,(180^o/n)$

Where i=1,2 ..... (n-1/2)

Switching sequences for the proposed multilevel cascaded Inverter

In this inverter, both pulse width modulation switching and general switching sequences are used in modified cascaded H Bridge multilevel inverter.

In pulse width modulation switching, the frequency in more than 1KHZ to 2KHZ, hence switching loss is significant. However pulse width modulation follows ideal sine wave nearby, which results in reduced level of THD in output of the multilevel cascaded bridge inverter.

Five level output AC can be generated by using the cascaded H Bridge configuration shown in Fig. 1. Two H-Bridge are connected in such a way that it can generate five numbers of switches, that is 6 switches are used intead of 8 switches in general.

The general switching sequences for this inverter are shown in Table 1.

It can be seen that for any sequence of switching, two are three of total power device (MOSFETs) and one body diode conduct. For +2V and -2V output two MOSFETs and one body diode conducts. For +4V and -4V ac output 3 MOSFET conduct.

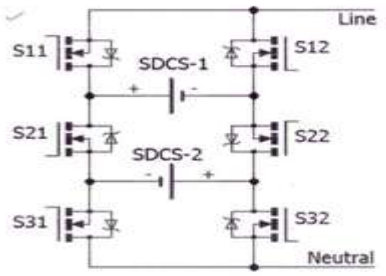
Hence reduced number of switches and conduction losses by using this modified H-bridge multilevel inverter.

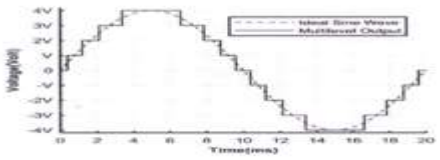
TABLE 1: SWITCHING SEQUENCES FOR 5 LEVEL

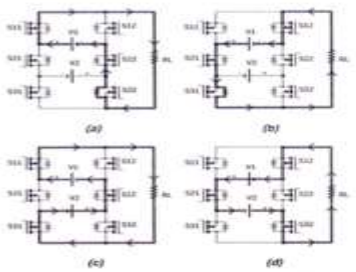
Cascaded modified H-Bridge Inverter

S_{11}	S_{12}	S_{21}	S_{22}	S_{31}	S_{32}	V_{out}
0	0	0	0	0	0	0
1	0	0	1	0	0	+2v
1	0	0	1	1	0	+4v
0	1	1	0	0	0	-2v
0	1	1	0	0	1	-4v

GENERATION 4 VOLTAGE LELVELS







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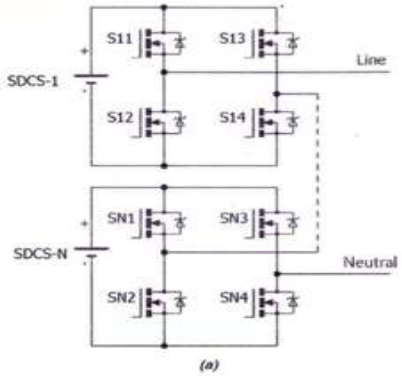
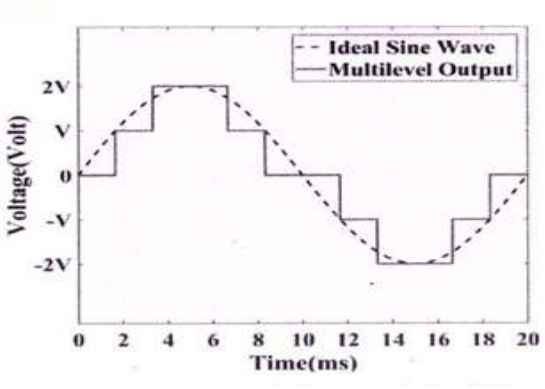
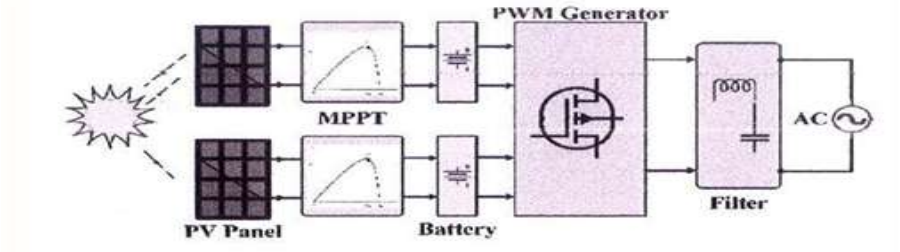
GENERAL STRUCTURE OF MODIFIED
FIVE LEVEL MODIFIED INVERTER







II. CONCLUSION:

A modified new topology with less number of switches is presented used to eliminating high frequency transitions. The switching losses reduced due to less number of switches used. Hence it can be worked at any switching frequency. Leakage current can be reduced. Also presented 5 Level CMLI switching sequences. The proposed model can be connected to grid by any other same frequency AC Source.

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