www.ijecs.in
International Journal Of Engineering And Computer Science ISSN: 2319-7242
Volume 5 Issue 11 Nov. 2016, Page No. 18832-18837

Investigation on Super Lift DC/AC Inverters Using Photovoltaic Energy for AC Component Application

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ABSTRACT:

The solar photovoltaic has the advantage of direct conversion of sunlight to electricity and also suitable for most of the regions therefore it is highly preferred when compared to other renewable energy sources. So the PV energy is considered as the source for the voltage lift technique. Voltage lift technique is a popular method wildly used in electronic circuit design. It has been successfully employed in dc-dc converter application in recent years and opened a way to design high voltage converters. However the voltage increases stage by stage along arithmetic progression. When compared with MLI where the harmonic content deteriorate as the number of levels increases, the super-lift dc-ac converter can reduce the harmonics with reduced number of levels and reduced devices. In the proposed super-lift dc to ac inverter the output increases stage by stage

Along a geometric progression. Thus it effectively enhances the transfer gain in power series. Our main objective is to design super-lift inverter with fuzzy based controllers is proposed for super-lift converters to lift positive input voltage and output voltage for power quality improvement. The simulation is conceded out by MATLAB/SIMULINK software

Index terms - voltage lift technique, super lift technique, split-capacitors, Split – inductors, geometric progression, voltage transfer gain.

I.INTRODUCTION:

Voltage lifting technique introduced Fang Lin Luo (2003), Super-Lift Technique has been successfully employed in design of DC/DC converters, and e.g. four series Luo-Converters. However the output voltage increases in arithmetic progression. Luo series Elementary, Re-lift and Super-lift converters introduces a novel approach – Super Lift technique that implements the output voltage increasing in geometric progression.

The DC/AC conversion techniques can be grouped into two categories: pulse width modulation (PWM) and multilevel

modulation (MLM). The proposed super-lift DC/AC converter one of the multilevel inverter has low voltage jump and smooth waveform in comparison to the PWM inverters. Most importantly, super-lift Multi-level DC/AC Inverters can achieve lower THD value. They inversion technology is of vital importance for industrial applications, including electrical vehicles and renewable energy systems, which require a large number of inverters. In recent years, inversion technology has developed rapidly. A fuzzy control is designed to control the gate signal and reduce the harmonic effect of Super- lift multilevel inverter and the load is given to the induction motor. The performance of the system with fuzzy control super lift multilevel inverter is studied in Matlab/ Simulink. Details on operation, analysis, control strategy and simulation results for super lift multilevel inverter - VSI controlled Induction motor are presented in the subsequent sections. The main objective of the project is to design and implementation of super lift DC/AC inverters with positive output super-lift converter using photovoltaic energy for AC module application and to increase the voltage in geometric progression and to reduce the harmonic effect. The objectives of this project report are design and implementation of super lift DC/AC converters and to efficiently increase the voltage.

II.OBJECTIVE:

Multi Level Inverters (MLI) can be employed for harmonic reduction since these converters are based on the series connection of single phase inverters and widely applied to the interface of renewable energy sources. There are three types of MLI structures such as diode clamped, flying capacitor and cascaded H Bridge. The drawback of this converter topology includes increased number of devices required and control complexity.

The proposed super-lift DC/AC converter is put forth for solar photovoltaic applications which perform the necessary voltage conversion. This DC/AC converter is normally used in medium to high power applications; they operate to reduce number of levels, minimized harmonics and improvement of precision value. It can be perform positive source voltage of one level to positive load voltage of another required level and incorporating intelligent control techniques such as fuzzy logical optimization technique for power quality important.

III.BLOCK DIAGRAM DESCRIPTION

The supply is given to the load (induction motor) through super lift multilevel inverter. The input of the super lift luo converter is derived from PV source; the super lift luo converter increases the voltage in geometric progression. The increased output voltage is given as the input to the super lift multilevel inverter the inverter converts DC/AC and the AC is given to the inductive load. The pwm control the

DOI: 10.18535/ijecs/v5i11.20

frequency signal of the converter and inverter.

The fuzzy controller is given to control and reduces the harmonic effect and also control the signal given to the inductive load

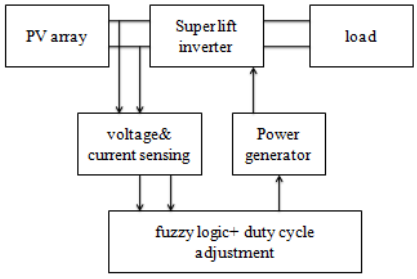

Fig.1.Block Diagram for super lift inverter with fuzzy controller

IV. PROPOSED SUPER-LIFT INVERTER CIRCUIT DIAGRAM

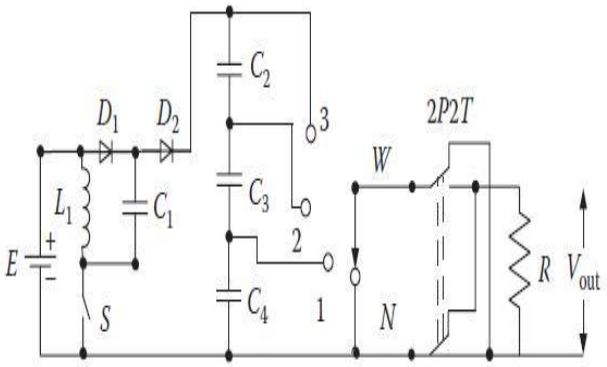

Fig.2. circuit diagram for super-lift inverter

Voltage lift technique has been successfully employed in design of DC/AC converters, e.g., four series Luo converters. However, the output voltage increases in arithmetic progression. It effectively enhances the output voltage. There is only one DC voltage source E needed in this circuit. A change-over-switch (2P2T) and a three-position band-switch are used in the circuit. When k = 0.5, the output voltage is 3E. Three capacitors, C2, C3, and C4, are used to split the output voltage in 3 levels: E, 2E, &3E.

$$\Delta i_L = V_{in}/2\ KT = V_0 - (\alpha+1)\ V_{in}/\beta\ L\ (1-k)\ T$$

The voltage transfer gains

$$G = V_0/V_{in} = \alpha+1+ (\beta-\alpha-1)\ K/1-K$$

V.INVERTER SWITCHING METHOD

S.No	Band switch position	Change over switch position	
		Switch ON state	Switch OFF state
1	S0	0	0
2	S1	E	-E
3	S2	2E	-2E
4	S3	3E	-3E

Table no: 1 Inverter Switching Method

Therefore, the operation status is as follows:

- *V*out = 3E: The change-over-switch is on, and the band-switch is at position 3.
- *V*out = 2E: The change-over-switch is on, and the band-switch is at position 2.
- *V*out = E: The change-over-switch is on, and the band-switch is at position 1.
- *V*out = 0: The band-switch is at position 0 (i.e., N).

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- *V*out = −E: The change-over-switch is off, and the band-switch is at position 1.
- *V*out = −2E: The change-over-switch is off, and the band-switch is at position 2.
- *V*out = −3E: The change-over-switch is off, and the band-switch is at position 3.

VI.SIMULATION OF SUPER LIFT MULTILEVEL DC/AC INVERTER

The increased dc voltage from super lift luo converter is fed to the super lift multilevel inverter and it converted dc to ac voltage. The 15 level ac output voltage is obtained from super lift inverters.obtained satisfactory simulation and experimental results. These super-lift multilevel inverters can also be used in other renewable energy systems and industrial applications.

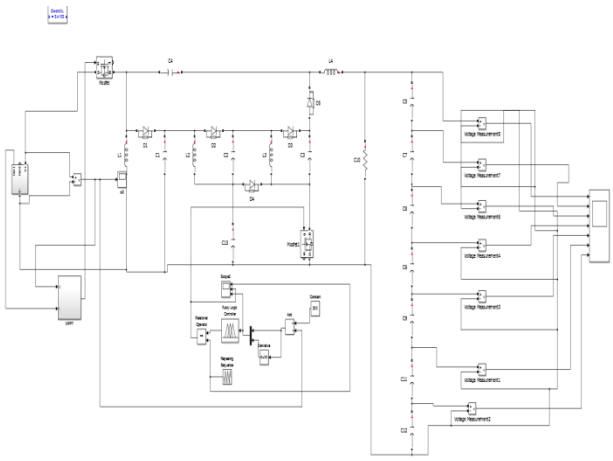

Fig.3.simulation diagram of super lift inverter

PARAMETER NAME	SYMBOL	VALUE
Input voltage from PV	VI	12 VOLTS
Output Voltage	VI	120 VOLTS
Inductor	L1,L2	540e-6μH
Capacitor	C1,C2	600 e-6
Multilevel Capacitor	C1 to C7	1000e-6
Frequency	F	50Hz
Load resistance	R	100Ω

Fig.4. Tabulation of parameters

VII.SIMULATION AND OUTPUT:

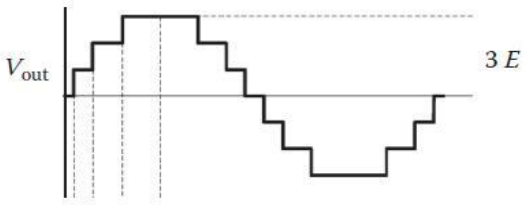

Fig No: 5 Seven Level inverter Waveform.

The voltage transfer gain in power law. This paper introduces a novel approach super-lift (SL) technique that implements the output voltage increasing in stage by stage along the geometric progression. It effectively enhances the voltage transfer gain in power series. It largely increases the voltage transfer gain in power-law. Very high output voltage is easily obtained. Simulation and experimental results these series Luo converters will be applied in industrial applications with very high output voltage.

XI.RESULTS

The positive output super-lift converter is designed with multilevel dc/ac inverter developed using fuzzy logic controller in MATLAB/Simulink and the output voltage from converter with and without fuzzy logic controller. When load resistance increased the settling time is reduced. When load resistance decreased the settling time increased.

DOI: 10.18535/ijecs/v5i11.20

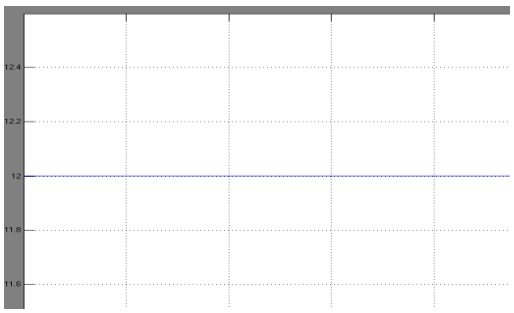

Fig .6 Input voltage from PV

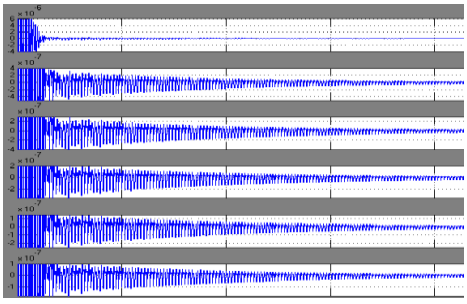

Fig.7 Output Voltage from Super lift multilevel inverter

XII. CONCLUSION

In this paper the new topology super lift inverters are designed and implemented by using photovoltaic energy as a source. A novel modulation technique is proposed for multilevel voltage source inverter and simulated in the MATLAB/SIMULINK environment and its performance parameters are analyzed for different levels of multilevel inverter. The output parameter increased 14 level ac voltage is analysed. The super lift multilevel inverters for different levels are modelled in the MATLAB/SIMULINK environment.

The super lift inverter is the best choice when compared to other inverter topologies due to the absence of the input voltage unbalance and freewheeling diodes. In the super lift multilevel inverter configuration the output is obtained in level and the output percentage THD is controlled by using fuzzy controller. The output is connected to the three phase AC induction motor as the load. The three phase voltage of 120 Volts AC is obtained across the output terminals .The harmonics is also reduced for the different load conditions of the three phase induction motor. The implementation of the proposed technique increases the voltage and obtains different pulse level of ac voltage. It reduces the harmonics significantly.

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XIII.BIOGRAPHIES

Johny renoald .A was born in Tamilnadu India. He received his Master Degree in the application of Power electronics and drives from Anna University Chennai. His area of interest includes Power Electronics, Circuit Theory, Single phase Matrix Converter fed Induction Motor Drives. he worked in M.P.S STEELS PVT LTD., KANCHIGODE .Currently he is working as a Assistant Professor in the department of Electrical and Electronics engineering at Vivekanadha Institute of Engineering and Technology for Women, Tamil Nadu,

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