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Decrease Total Harmonics Distortion by using Filter in Three Phase 27- Level CMI

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Abstract— This work show a single phase and three-phase 28-echelon cascaded H-bridge multilevel inverter topology for DC systems with a completely unique Pulse width-modulated control concept is used. Conventional cascaded H-bridge multilevel inverter for two and three cells per phase, and then the control is used to an inverter with multi-level cells. In this method, the diode clamps the voltage across the switch to one level, and all diodes are selected as same type. This technique is effectively reduces an oversized number of specific harmonic, and also the output voltage lead to low total harmonic distortion and switching frequency. The proposed research used a CMLI with filter and without filter for reducing the THD. The overall performance and presentation of the candidate is good and satisfactory.

Keywords—*Multilevel Inverter, Matlab 12b, AC and DC Voltage, Cascaded Connection*

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INTRODUCTION

For an induction motor applications cascade inverters are ideal that has much no. of separate DC sources (batteries) available for the individual H-bridges, these inverters aren't a choice for series hybrid induction motors because cascade inverters can't be easily connected back-to-back. For series-configured induction motors where an on-board combustion engine generates AC power via an alternator or generator, a multilevel back-to-back diode clamped converter drive will best interface with the supply of AC power and nonetheless still simply meet the high power and/or high voltage needs of the induction motor.

The offered voltage sources of associate degree induction motors are from an generator or combustion-engine generator. A rectifier is employed to converts this AC voltage to DC for the electrical energy storage devices on board – batteries or extremist capacitors. And associate degree electrical converter is employed to converts the DC voltage to variable voltage variable frequency AC so as to drive the most induction motor.

I. LITERATURE SURVEY

M. Abolhassani [2], Applying an approach for the power quality improves of medium voltage applications. A modular transformers strategy together with modular power electronics cubes is improved. Owing to applying this approach, the input current harmonics reduces to well below the importance of IEEE 519-1992 whereasthe quantity of capacitance installedwithin the drive is considerablyreduced. In addition, by utilizing modular transformers approach and eligible cooling, power density of the drive is growth. The powerissue of system is then also raised by this approach.

pernimaYousefpoor et al [5], total harmonic distortion reduction of the output voltage of multilevel inverters is mentioned. An efficient approach in reducing the harmonic contents of the inverter's output voltage is total harmonic distortion reduction. In multilevel inverters with a fundamental frequency switching strategy (each switch turning on and off once per output cycle), the switching angles may be chosen in order that the output total harmonic distortion is reduced (such because the so-called optimal reduction of total harmonic distortion strategy). to get the optimum switching angles, an optimisation algorithmic rule is applied to the output-voltage total harmonic distortion. In three-phase multilevel inverters, the optimisation algorithmic rule is usually applied to the phase voltage of the inverter. This leads to the minimum total harmonic distortion in phase voltage but not essentially in the line-to-line minimum total harmonic distortion, whereas in three-phase applications, the line-voltage harmonics square measure of the most concern from the load point of view. In this paper, making use of the genetic rule, a complete harmonic distortion reduction method is directly applied to the line-to-line voltage of the inverter. This paper relies on a seven-level inverter. To verify the simulation results, a seven-level cascaded-H-bridge-inverter-based hardware prototype, as well as an ATMEGA thirty two power unit (Volt Ampere Reactive) microcontroller, has been implemented. Both of the simulation and experimental results indicate superiority of this approach over the usually used phase-voltage total harmonic distortion reduction approach.

Ounejjar et al [7], the authors propose a completely unique six-band hysteresis technique to efficiently control the seven-level Packed U Cells (PUC) convertor. The projected PUC combines benefits of the flying capacitor and also the cascaded H-bridge topologies. The novel control strategy is projected so as to insure a good operation of the PUC

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converter in both of the electrical converter and rectifier modes. In case of rectifier operation, the projected six-band controller is meant to draw a sinusoidal line current (load current in case of inverter operation) with a unity power factor. Harmonics contents of line current (or load current) and rectifier input voltage (or electrical converter output voltage) are very low which allows the reduction of the active and passive filters ratings ensuing on a really high energetic efficiency and a reduced installation cost. The projected idea was validated through experimental implementation by making use of real-time controller, the DS1103 of d space.

Deepak Sankar et al[9],In this paper, a comparative study of four levels of MLI's is presented. Control system based on Sinusoidal Pulse Width Modulation (SPWM) is accepted due to its ease of implementation. Additional quantity of levels results in reduced THD and near sinusoidal output. Simulation is done using Matlab.Cascaded H-bridge multilevel inverters are the more suitable inverter topologies for grid linked application. A comparison of four stages of MLI (5 level, 7 level, 9 levels and 17 level) is completed and SPWM is accepted as the control scheme due to its ease of implementation. From the results it can be determined that, with an increase in the quantity of levels, the output expands its quality by a decreasing in THD. The value of harmonic distortion varies from 39.24% for a five level CHB-MLI to 13.69% for a Seventeen level CHB-MLI. But the amount of switches is increased from 8 to 32 thereby increasing the circuit difficulty.

II. PROPOSED WORK & RESULTS

The converter topology relies on the series connection of single-phase inverters with separate DC sources. Figure 3.5, shows the power circuit for one phase leg of a three-level , five-level and seven-level cascaded inverter. The resulting phase voltage is synthesized by the addition of the voltages generated by the various cells. In a 3-level cascaded inverter every single-phase full-bridge inverter generates 3 voltages at the output: +Vdc, 0, -Vdc (zero, positive DC voltage, and negative DC voltage). This can be made attainable by connecting the capacitors sequentially to the AC side via the power switches. The resulting output AC voltage swings from –Vdc to +Vdc with 3 levels, -2Vdc to +2Vdc with five-level and -3Vdc to +3Vdc with seven-level electrical converter. The staircase wave form is almost sinusoidal, even without filtering.

The control of the proposed method for a 14-echelon and 28-echelon single phase and three phase cascaded multilevel inverters is simulated by using the MATLAB/SIMULINK software. The simulation results of single phase and three phase for the developed 14-echelon and 28-echelon cascaded multilevel inverters are show that has many advantages such as decrease number of switches, lower electromagnetic interference, low harmonic distortion and the total harmonic distortion of the proposed inverter is consider by alleviated and the dynamic response are also improved significantly. The ratio of the separate DC voltage sources (Vdc1, Vdc2 and Vdc3) that used in single phase and three phase 14-echelon cascaded H-bridge multilevel inverter, as given by-

Vdc1: Vdc2: Vdc3 = 1Vdc : 2Vdc : 3Vdc

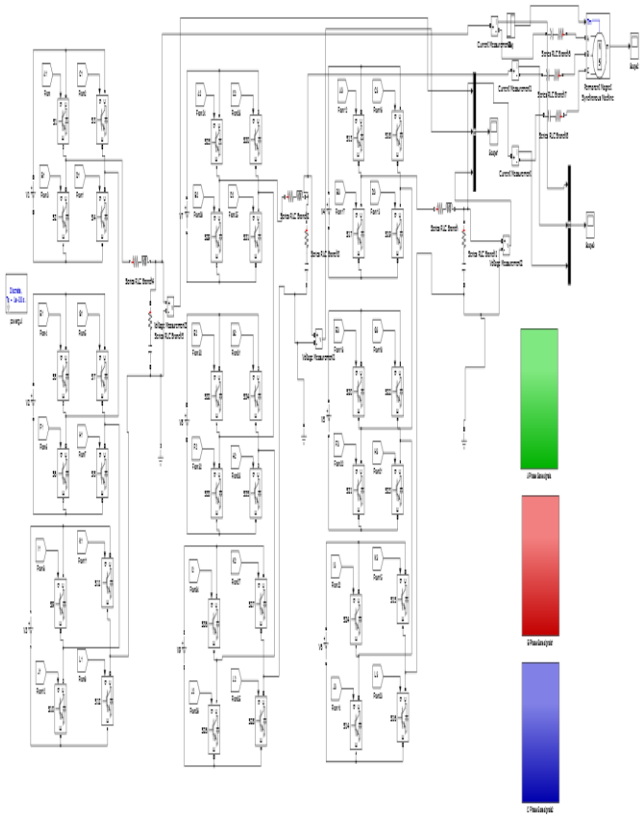

Fig.I-Echelon Cascaded H-Bridge Multilevel Inverter with filter and Load

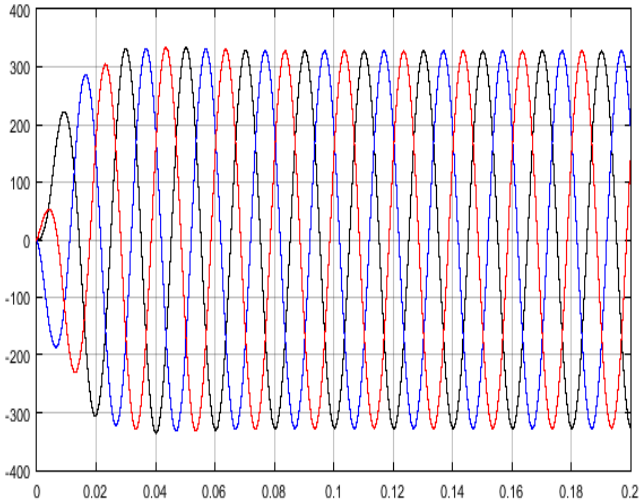

Fig II-.Simulation Output Voltage Waveform for Single Phase 28-Echelon MLI

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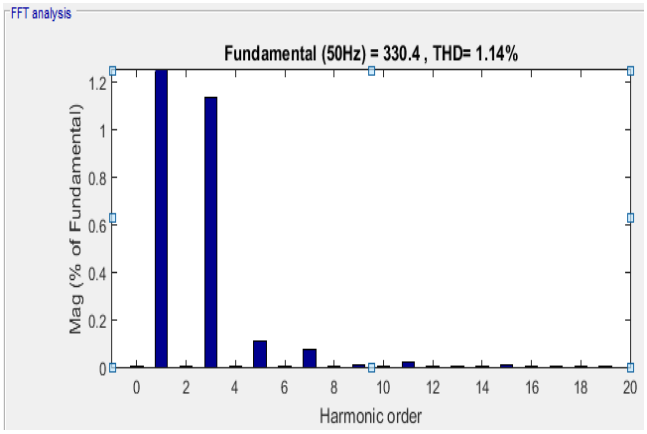

Fig III- FFT Analysis for Single Phase 28-Echelon MLI

Figure-II show the simulation output voltage waveform for three phase 28-echelon cascaded H-bridge multilevel inverter and the FFT analysis of that voltage waveform shown in Figure 5.17, that FFT analysis gives the magnitude in terms of percentage of fundamental with respect to frequency order. The simulation result gives the total harmonic distortion level for three phase 28-echelon cascaded H-bridge multilevel inverter with filter and load that is 1.14%. Therefore the total harmonic distortion in 28-echelon inverter with filter and load is less by 12.73% with respect to 28-echelon inverter without filter and load. The study can further be analysis by employing control schemes to have advance dynamic response and by using high level inverters.

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