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ANALYSIS OF THIRTY SWITCH3-ΦSEVEN LEVEL INVERTER FED INDUCTION MOTOR DRIVE

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ABSTRACT

This paper presents a new 7-level inverter for induction motor drive. The Inverter presented here gives a seven level output voltage. This configuration required very less number of switches, carrier signals and gate drivers when compared to diode clamped multi-level inverters, flying capacitor multi-level inverter and cascaded multi-level inverter.Software tool used is MATLAB/ SIMULINK is used for simulation of the inverter and the results are presented at the end.

Keywords: Induction Motor Multilevel Inverter, 7level,and reduced switches.

I. INTRODUCTION

This electrical converter synthesizes many completely different levels of DC voltages to provide steps (stepped) that approaches the pure sine wave. Preferred MLI topologies are Diode Clamped, Cascaded MLI. During this paper we have a tendency to use a cascaded multi-level inverterthat comprises some H-bridge inverters and with equal and un-equal DC current sources.

Among these electrical converter cartographies, the cascaded H-bridge structure has got the competence of utilizing completely unusual dc voltages on the personage H-Bridge cells which ends in ripping the ability of conversion and asymmetrical structure inverters and is obtained. To produce an out sized variety of output steps while not increasing the amount of dc voltage sources, uneven structure converts are often used. The cascaded H-bridge can be operated in either even or uneven converter mode.

II.CASCADED H-BRIDGECONVERTER

A. Full H-Bridge- Three level inverter

In order to make output voltage either +Ve or –Ve Polarity H-bridge with 4 active switches are used. It can also be simply zero volts. It depends on switches operation in the circuit. It is practically easy to take a broad view the number of distinct levels. The output levels of S number of stages and its associate number can be shown in figure. In order to get two and three voltage amplitudes we should use single H-bridge. The number output voltage levels of cascaded full H-bridge inverter are given by 2n+1 and voltage step have each level is given by V_{dc}/n. The switching table is given in Stand I and II.

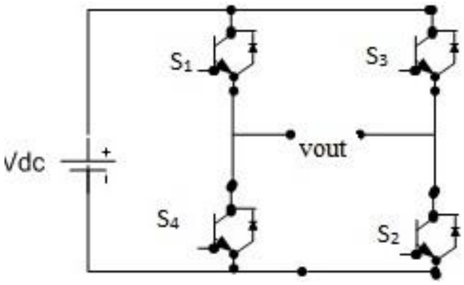

Fig.1.revealH-bridgeinverter.

Stand I Switching counter for cascaded H-bridge for 3- level inverter.

turn onswitch	Level of Voltage
S_1, S_2	$V_{dc}/2$
S_2,S_4	0
S_3, S_4	$-V_{dc}/2$

B. 7-level cascaded H-bridgeInverter

Fig.2.represents7-level cascaded H-bridgeinverter and Table II show the switching states of the seven levels cascadedH-bridgeinverter.

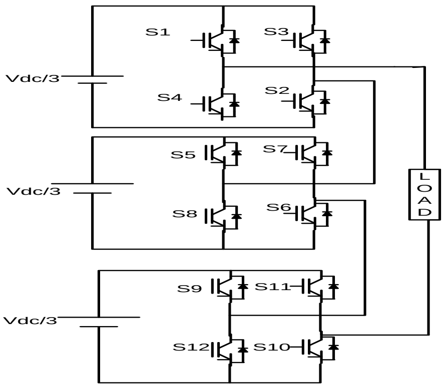

Fig.2.7-level cascaded H-bridgeinverter.

Stand IIrepresent cascadedH-bridgefor 7-level inverter switching counter.

switch Turn on	Voltage Level
S_1,S_2,S_5,S_6,S_9,S_{10}	V_{dc}
S_1, S_2,S_5,S_6,S_9,S_{11}	$2V_{dc}/3$
S_1,S_2,S_5,S_7,S_9,S_{11}	$V_{dc}/3$
S_1,S_3,S_5,S_7,S_9,S_{11}	0
S_3,S_4,S_5,S_7,S_9,S_{11}	$-V_{dc}/3$
S_3,S_4,S_7,S_8,S_9,S_{11}	$-2V_{dc}/3$
S_3,S_4,S_7,S_8,S_{11},S_{12}	$-V_{dc}$

Conventional topology using three Vdc/3 voltagesources, each unit consist of three H-brides with four switches together forming twelveswitches. Every bridgeconsists is 3 levels, $+V_{dc}$, 0, $-V_{dc}$to produce stepped seven level staircase waveforms we can combine of three bridges in such a fashion.

III. PROPOSED NEW MULTILEVEL TOPOLOGY

A. General Description

This topology is sub-divided into two parts namely levelproduction and the otherpart is called polarity production.

The technique consists of two parts high frequency and low frequency to generate the multilevel voltage output. In order to generate a complete multilevel output level production is used and polarity production will generate the required polarity for the output. The voltage inversion cartography in the 7-level is clearly exposed in figure 3. This requires three isolated sources and 10 switching devices.

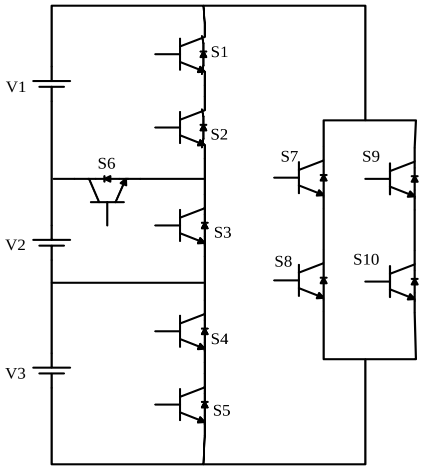

Fig.3.Schematic of a seven-level inverter in single phase

B. Switching Sequences

Table III correspond to the switching sequence

Levels	One	Two	Three
Switches	2-3-5	2-5-6	1-5

Possible switching patterns are (2–3-4), (2-3-5), (2-6-5), furthermore (1, 5) are preferred for levels 0 up to 3, correspondingly.

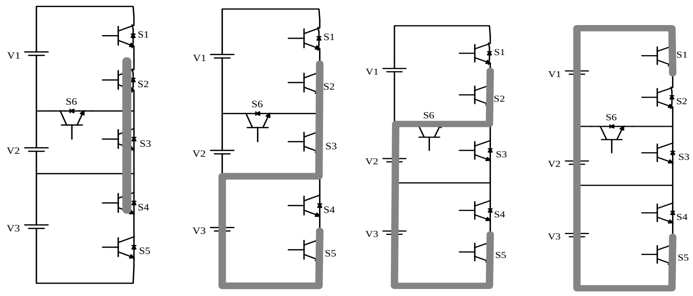

Fig.4. Switching operation for different levels

IV. PROPOSED INVERTER FED INDUCTION MOTOR

Proposed method can be increased more number of voltage level. This cartography is schedule and it enhances to more number of voltage amplitudes by including equidistance stage in Fig.3. Fig.5. 3-ϕreversing voltage7-level inverter fed induction motor.

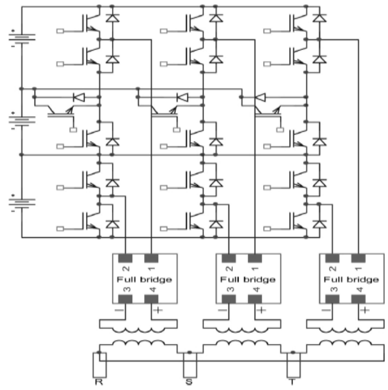

Fig.5.3-ϕreversing voltagemultilevel topology

Anticipated7-level inverter fed induction motor; the voltage reaches to motor harmonics are less. The result is a speed response is smooth and torque ripple will be.

V. SIMULATION RESULTS

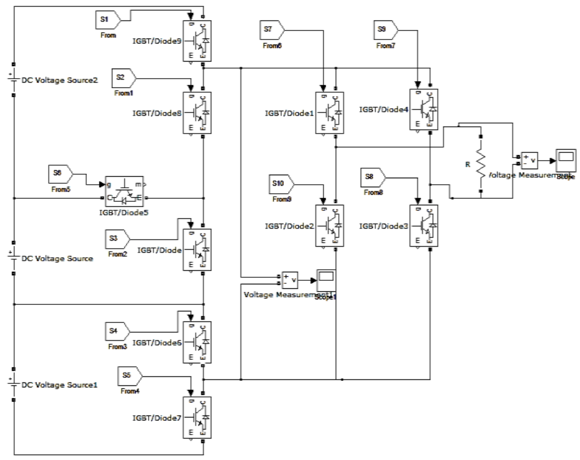

Fig.6.Simulinkmold of ananticipated1-ϕinverter.

Fig.6. point up the 1-ϕ seven level reversing voltageinverter with of sixswitches for voltage level and full H-bridgefor polarity discrepancy.

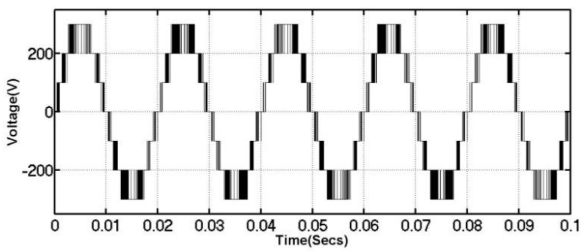

Fig 7.point up the 7-level invertervoltageof the reverse voltage single phase inverter with peak amplitude of 300V.

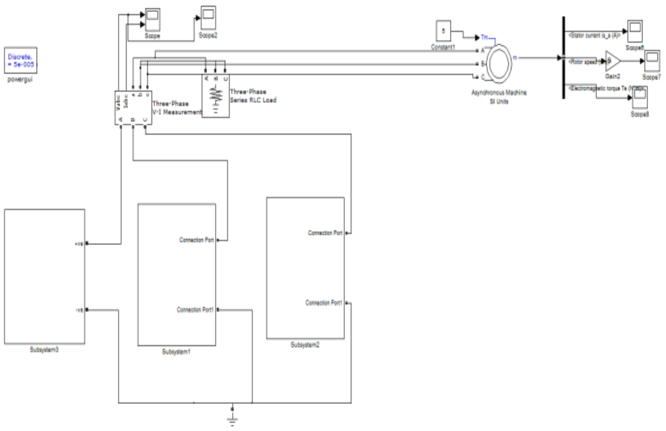

Fig.8.point up the reversing voltageinverter implementation in three phases connected to the induction motor drive.

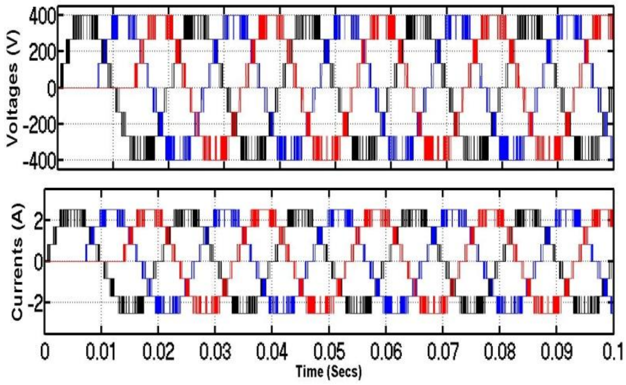

Fig.9. point up the 3-ϕvoltages with peak amplitude of 400V and three phase current of 2.4 A.

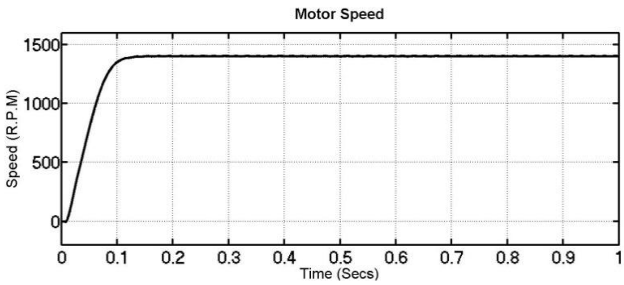

Fig.10.point up the speed of the reversing voltagefed induction motor, reaches to the steady state at 0.12 sec.

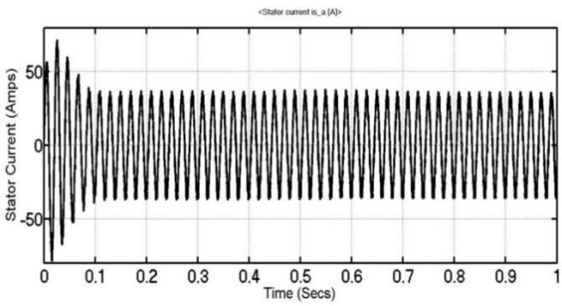

Fig.11. simulated output wave form of the stator current of the 3-ϕreversing voltagebased inverter.

Fig.11. point up the stator current wave form of the three phase reversing voltageinverter fed induction motor, it attests the initial current is 80A for overcoming the inertia, at steady state the stator current reaches to 42A.

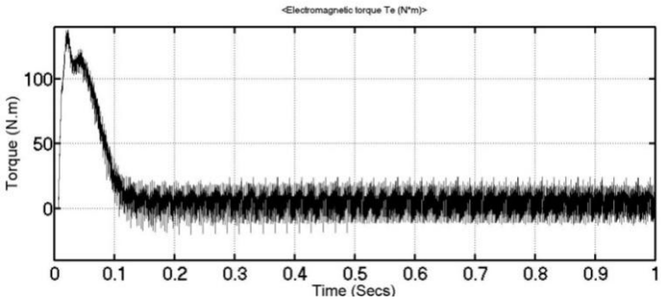

Fig.12. simulated wave form of the Electromagnetic torque of induction motor.

TABLE IV: mechanism in cascaded and reversing voltagemulti-level inverters

multi-level inverter	switches
Cascaded H-bridge inverter	36
Reverse voltage inverter	30

VI. CONCULSION

This paper represents 7-level inverter fed induction motor drive with reversing voltage technique single phase 7-level inverter has been simulated by using MATLAB/SIMULINK. Induction motor Electromagnetic torque and stator characteristics are observed and presented in the paper. TraditionalCascaded H-bridgeinverter requires 36 whereas reversing voltage Inverter require only 30 and obtained similar output.

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