

REDUCTION OF HARMONICS IN MULTILEVEL INVERTER WITHOUT USING DC LINK CAPACITOR

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Abstract

An enlistment driving system is an AC electric motor wherein the electric flow in the rotor expected to Produce torque is acquired by electromagnetic induction from the attractive field of the stator Winding. The stator winding is excited by the alternating current supply through inverter device.

Normally the inverter operates to produce alternating current from the direct current supply. The magnitude of converted output voltage is less than the input voltage because of the conversion losses and harmonics by load. The different types of inverter circuits are developed for Induction motors output of which, the cascaded multilevel inverter is provide the better performance than others. A staggered inverter is a power electronic gadget which is equipped for giving wanted exchanging voltage level at the yield utilizing various power level DC voltages as an info. Generally, two-dimension inverter is utilized so as to produce the AC voltage from DC voltage. Staggered inverters are progressively increasing much significance in mechanical applications.

By using power electronic semiconductor switches the higher rating of output can be extracted. When the number of switches increased in multilevel inverter the total harmonic distortion of the output voltage is reduced tremendously. In this proposed work a single phase (9 level) multilevel inverter is analyzed for open ended induction motor without DC link capacitor. It is opted for non-regenerative or generative

low and medium alternating current conversion. In absence of dc link capacitor, the voltage balancing is achieved by the switched state redundancies in power converter circuit. All the simulation works are carried out in the MATLAB/Simulink environment.

Keywords

Multilevel Inverter, PWM, DC Link Capacitor, THD

INTRODUCTION

An inverter gives an AC voltage from dc power sources and is valuable in controlling hardware and electrical gear appraised at the air conditioner mains voltage. Also, they are generally utilized in the exchanged mode power supplies reversing stages. The circuits are characterized concurring the exchanging innovation and switch type, the waveform, the recurrence and output waveform.

A multilevel inverter is a power electronic switches which is fit for giving wanted rotating voltage level at the yield utilizing numerous lower level DC voltages as information. For the most part a two-level inverter is utilized so as to produce the AC voltage from DC voltage. Its undeniably picking up significance for modern and utility applications because of their various characteristic gainful highlights. The need of staggered converter is to give a high output control from medium voltage source. The staggered inverter comprises of a few switches.

Higher voltage can be generated using the devices of lower rating. Increased number of voltage levels produces better voltage waveform. Switching frequency can be reduced for the PWM operation. The main advantage of multilevel inverter is the total harmonic distortion of output voltage reduced when the number of levels increased[12].

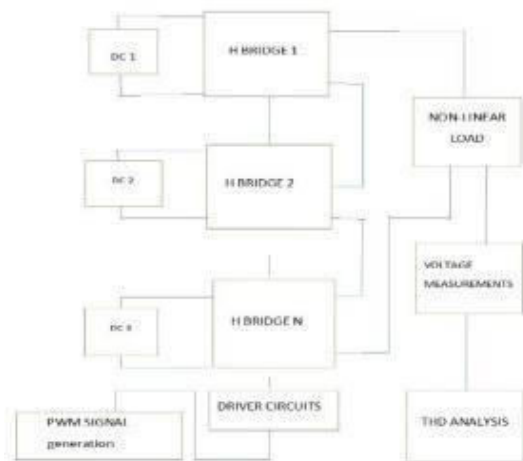


Fig 1 Proposed Block Diagram of the System

In the proposed work a single phase (9 level) multilevel inverter is analyzed for open ended induction motor without DC link capacitor as shown in the fig 1. It is suitable for non-regenerative or generative low and medium power AC-AC conversion. The voltage balancing control is presented for regulating the floating DC capacitor voltage.

These circuits are regularly utilized in mechanical autonomy and different applications to permit DC engines to run advances or in reverse. Most DC-to-AC converters (control inverters) most AC-AC converters, the DC-to-DC push pull converter most engine controller and numerous different sorts of intensity gadgets use H spans. Specifically, a bipolar stepper engine is constantly determined by an engine controller containing Two H Bridges.

A H scaffold is worked with four switches (strong state or mechanical). At the point when the switches S1 and S4 (as indicated by the primary figure) are shut (and S2 and S3 are open) a positive voltage will be connected over the motor. By opening S1 and S4 switches and shutting S2 and S3 switches, this voltage is turned around, permitting reverse activity of the engine.

The H-connect plan is commonly used to switch the extremity/course of the engine, yet can likewise be utilized to 'brake' the engine, where the engine reaches an abrupt stop, as the engine's terminals are shorted, or to give the engine 'a chance to free run' to a stop, as the engine is successfully disengaged from the circuit. A Pulse Width Modulation (PWM) Signal is a strategy for producing a simple sign utilizing a computerized source.

PWM is especially appropriate for running inertial loads, for example, engines, which are not as effectively influenced by this discrete exchanging. Since they have inactivity they respond slower. The PWM changing recurrence must be sufficiently high not to influence the heap, or, in other words that the resultant waveform seen by the heap must be as smooth as could reasonably be expected.

The fundamental favorable position of PWM is that power misfortune in the exchanging gadgets is extremely low. Allout symphonious twisting (THD) is an estimation that reveals to you the amount of the contortion of a voltage or current is because of sounds in the sign. A run of the mill THD estimation will utilize a 1 kHz reference test tone.

This reference sign is gone through the sound gadget under test, and its THD figured from the range. Decrease of Total

Harmonic Distortion (THD) in Power Inverters. Inverters utilizing Pulse Width Modulation (PWM) exchanging use semiconductor gadgets to change the DC control into controlled AC control.

PWM exchanging is a productive method to create AC control, permitting adaptable control of the yield size and recurrence. The PWM waveform is produced by looking at a reference signal and a transporter waveform. The PWM waveform controls the Insulated Gate Bipolar Transistor (IGBT) changes to produce the AC output.

CIRCUIT DIAGRAM

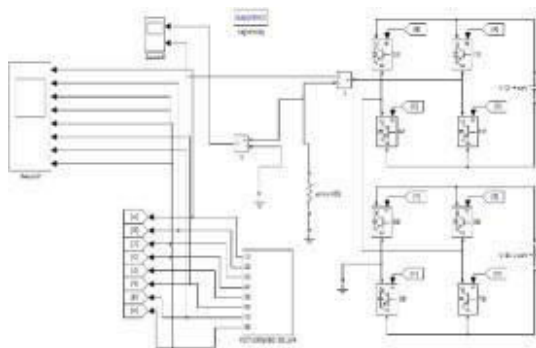


Fig 2 Proposed Multilevel Inverter Circuit Diagram

EXPERIMENTAL RESULT

In this circuit totally eight switches are used to produce nine level inverter and the two DC sources for input voltage 12v and 38v. Nine level output comes in 50v with respect to DC source voltage. In this circuit, voltage from the nine level inverter is measured using voltage measurement and current from the nine level inverter is measured using current measurement.

Goto block sends the signals to the from block. Pulse-generator generates signals to Goto block. The pulses generated from Pulse-generator are displayed in Scope 6.S1,

S2, S3, S4, S5, S6, S7, S8 (These 8 switches are used in this circuit). The switches S2 and S4 are connected between S5 and S7. Ground is connected between switches S6 and S8.

Here IGBT (insulated gate bipolar transistor) diode act as a switch. IGBT is a three-terminal power semiconductor gadget basically utilized as an electronic switch which, as it created, came to join high productivity and quick exchanging. This gadget is able for a few applications, for example, utilized in power hardware, especially in PWM (Pulse Width Modulated), UPS (uninterruptible Power Supplies), SMPS (Switched-Mode Power Supplies), and other power circuits. It builds the effectiveness, dynamic execution and decreases the dimension of the noise.

It is comparably fitted in the of full mode converter circuits. Improved IGBT is available for both low exchanging misfortune and low conduction misfortune. These gadgets are for the most part utilized as switches, for example recurrence converter and chopper applications, the variety of a diode is most significant, on the grounds that when the exchanging of the IGBT is OFF, at that point the current is controlled by the heap that is inductive as a rule. DC source voltages are set in to 38v and 12v.

Now we have to find THD analysis for the nine level inverter circuit. The maximum frequency is 100. If we set 110 or 150 THD analysis is above 50%. THD analysis is 19.86% for the frequency 100. The simulation work is done in MATLAB Simulink and the results are verified.

SIMULATION RESULTS

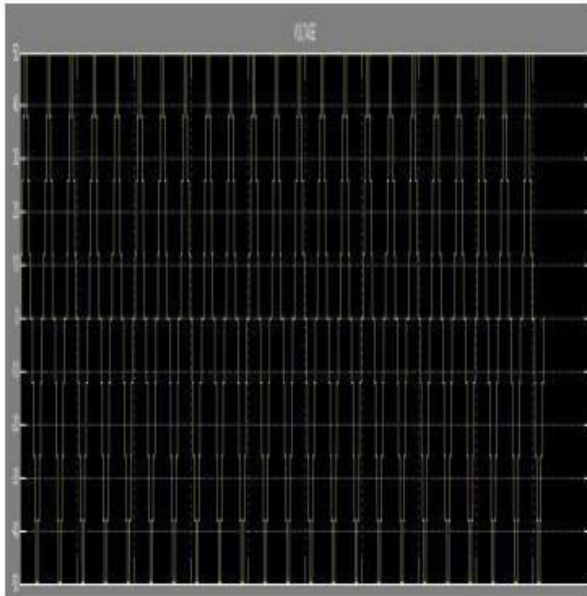


Fig. 3 Voltage Waveform

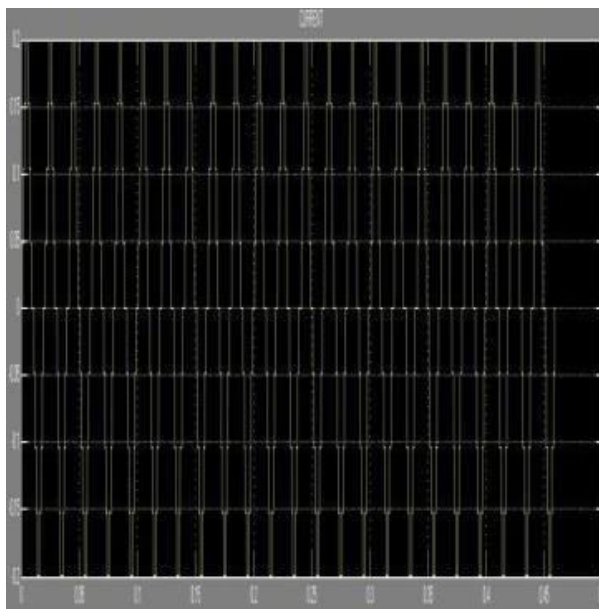


Fig. 4 Current Waveform

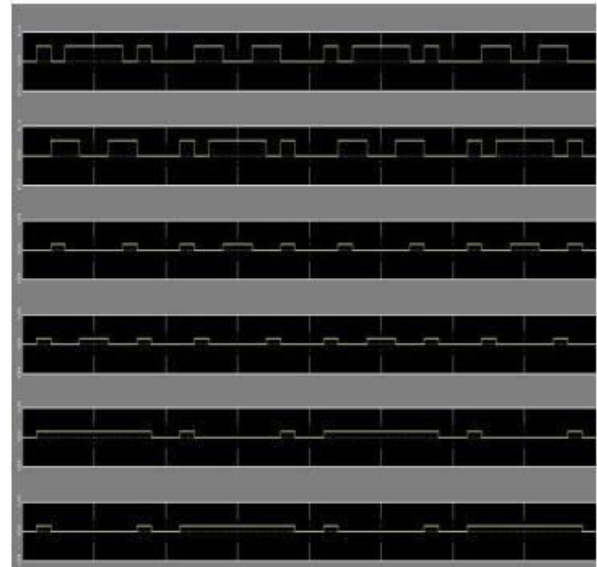


Fig. 5 Pulses Waveform

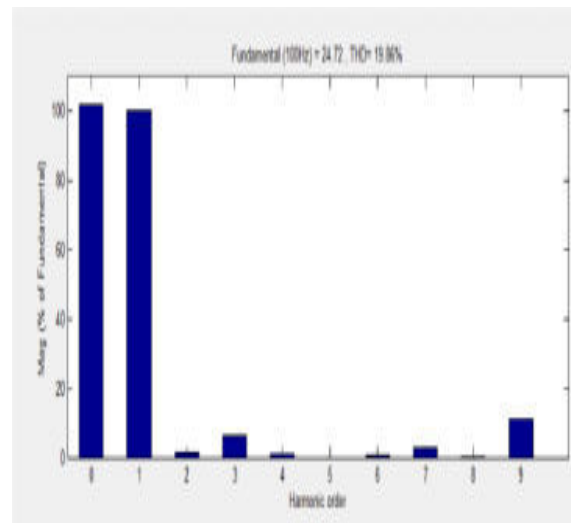


Fig. 6 THD Analysis

CONCLUSION

The analysis of a single phase multilevel inverter with a nine-level multilevel inverter topology with DC input sources was studied. The nine level inverter output is generated using MATLAB and also THD analysis is also analyzed. THD=19.86% for frequency 100Hz. The pulse is also generated from pulse generator. Goto block

receiving signals to from block. The simulation was done using MATLAB R2013a Simulink. The various modules were modelled and the overall system was simulated. The overall system model consists of the Multilevel inverter, IGBT diode, Switching circuit.

The details of various modules and SIMULINK diagrams including output are described above.

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