

IMPLEMENTATION OF MULTILEVEL INVERTER FED 3-PHASE I.M DRIVE BY USING PWM TECHNIQUE- A REVIEW

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ABSTRACT:

Electrical engineering is subdivided in to a wide range of subfields including, electronics, digital computers, telecommunications, control systems, signal processing and microelectronics.

In this paper author is trying to review, different methodologies available for control the speed of an induction motor by using three level diode clamped multilevel inverter. With the help of V/f method an open loop speed control can be achieved. The main objective of this paper is to carry a systematic review of the available literature and to control the speed of induction motor techniques.

KEY WORDS: Induction motor, V/f method, multicarrier PWM, DTC method, hybrid converter etc.

INTRODUCTION:

An induction motor also called as asynchronous motor is an AC electric motor in which the electric current in the rotor needed to produce torque is obtained by electromagnetic induction from the magnetic field of the stator winding. An induction motor can therefore be made without electrical connections to the rotor as are found in universal, DC and synchronous motors. Nowadays most of the industries use induction motor because of his constant speed application. In many applications AC motors are preferred to DC motors, in particular an induction motor due to its low cost, low maintenance, lower weight, higher efficiency, improved ruggedness, and reliability. All these features make the use of induction motors mandatory in many areas of industrial applications. The inverters in such application areas as stated above should be able to handle high voltage and large power. A power electronic device with Adjustable speed ac machine system is equipped with an adjustable frequency drive is used for speed control of an electric machine. Because of the advancement in power electronics and semiconductor technology has triggered the development of high-power and high-speed semiconductor devices in order to achieve a smooth, continuous, and step-less variation in motor speed. A used Voltage or current converters helps to they generate discrete output waveforms, force the use of

machines with special isolation and in some applications large inductances connected in series with the respective load With multilevel converters we can overcome unwanted operating characteristics associated with pulse- width modulation (PWM) converters.

LITERATURE SURVEY:

José Rodriguez, Senior Member, IEEE, Jih-Sheng Lai, Senior Member, IEEE, and Fang Zheng Peng, Senior Member, IEEE: Multilevel inverter technology is emerging technology, and it has become an important alternative in the area of power medium-voltage energy control. This paper presented the vital topologies e.g. cascaded multi cell, capacitor-clamped (flying capacitor), and diode-clamped inverter (neutral-point clamped) which uses separate dc sources. Upcoming topologies like asymmetric hybrid cells and soft-switched multilevel inverters are discussed in this paper. This paper also presents the most relevant control and modulation methods developed for this family of converters: multilevel sinusoidal pulse width modulation, multilevel selective harmonic elimination, and space-vector modulation. Special attention is dedicated to the latest applications of these converters such as laminators, conveyor belts, and unified power-flow controllers. The need of an active front end at the input side for those inverters supplying regenerative loads is also discussed in this paper, and the circuit topology options are also presented. Finally, the peripherally developing areas such as high-voltage high-power devices and optical sensors and other opportunities for future development are addressed by the author.

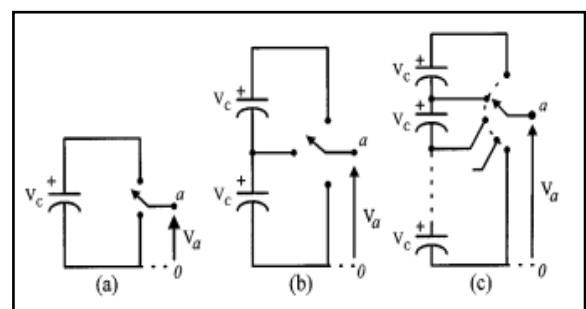


Fig. No.1. Single Phase leg of an inverter a) two levels b) three levels and C) n levels

This paper has empowered us with a theory and analysis of multilevel inverter circuit topologies and their control strategies. Different applications using different inverter circuits were also discussed by the author. Today, more attention given towards commercial products are based on the multilevel inverter structure, and worldwide research and development of multilevel inverter-related is recent trend. This paper cannot cover or reference all the related work, but the working principle of different multilevel inverters has been introduced systematically. The intention of the authors was simply to provide groundwork to readers interested in looking back on the evolution of multilevel inverter technologies, and to consider where to go from here.

Miguel F. Escalante, Jean-Claude Vannier, and Amir Arzandé[20]: In this paper the different limitations are imposed by a direct torque control (DTC) strategy on multilevel inverters are discussed. One control strategy is proposed in order to fulfill those requirements when a flying capacitor multilevel inverter is used. In this paper simulation and practical results will confirm the performance of the implemented strategy when using the multilevel inverter to control an induction motor by the DTC principle. Author has also tried to show advantages of using a multilevel inverter with a DTC strategy are discussed in the great length.

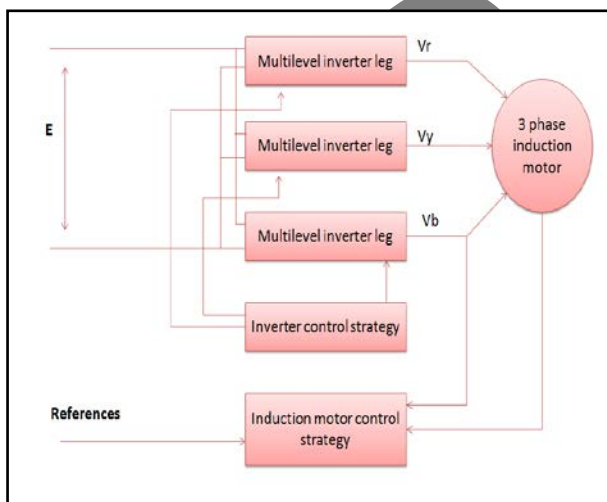


Fig. No.2. Typical configuration of a three-phase multilevel inverter motor drive

In this paper author has presented the analysis of the problems of a multilevel three phase inverter while using it in DTC strategy. To overcome limitations a new control strategy is proposed; flying capacitor multilevel inverter. The implemented strategy will be able to maintain the flying capacitor voltages also it will control the voltage level as per the feedback signal. Simulation and practical results have demonstrated the

different control strategy performances. Moreover, simulations of a multilevel DTC strategy have demonstrated the potential advantages of using a multilevel inverter and a DTC strategy. Author says if proposed method is implemented it will give advantages like flux and torque quality improvements.

Madhav D. Manjrekar, Thomas A. Lipo: In this paper the author has tried to review various topologies and modulation strategies for utility and drive applications. This paper is dedicated towards the investigation of a 500 HP induction machine drive based on a seven-level 4.5 kV hybrid inverter. The topological structure and operating principles of the proposed approach are presented by the author. Various design criteria, spectral structure and other practical issues such as capacitor voltage balancing are discussed in this paper.

Table No.1. Comparison of Seven-Level Inverter Topologies

Method Adopted	Primary device used	DC buses capacitors	Levels in the output
Clamped diode	36	6	7
Flying Capacitor	36	16	7
Traditional H bridge	36	9	7
Modified H bridge	24	6	7

The feasibility of the proposed approach is verified by doing simulation on computer. The proposed topology results from modifying the traditional structure of an H-bridge multilevel inverter. It is demonstrated that by employing non identical dc voltage sources one can obtain significant change in the number of synthesized levels. With the proliferation of semiconductor technology, a trade-off has been observed in the selection of power devices in terms of switching frequency and voltage blocking capability. Devices used for faster switching rates are known to have limited voltage blocking capability and vice versa. This paper has proposed a synergistic approach which combines the fast switching ability of IGBTs and large voltage blocking capability of GTO thyristors together.

Sanjay Lakshminarayanan, Student Member, IEEE, Gopal Mondal, Student Member, IEEE, P. N. Tekwani, Student Member, IEEE, K. K. Mohapatra, and K. Gopakumar, Senior Member, IEEE: In this paper, author has developed a 12 sided polygonal

voltage space vector generation with common mode elimination (CME) is proposed for an induction motor drive. An open-end winding configuration is used for the motor. The implemented multilevel structure is achieved by cascading only the conventional two-level inverters with asymmetrical dc link voltages.

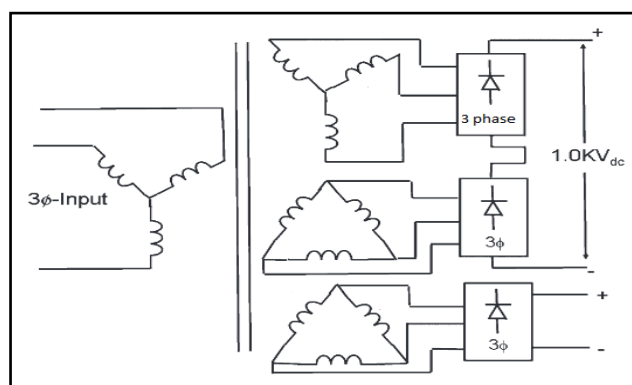


Fig. No. 3. Asymmetrical dc link voltage generation.

By proper selection of voltage vectors with identical common-mode voltage from the opposite ends, a pulse width modulation (PWM) strategy with zero common-mode voltage variation can be achieved for the entire modulation range. Along with the CME, the implemented 12-sided polygonal space vector based multilevel inverter structure has increased modulation range while neglecting the presence of 5th, 7th, 17th, 19th, etc., harmonics up to 12-step operation.

CONCLUSION:

The number of papers in this field is increasing exponentially in recent years, and researchers are paying more attention towards it. There is obvious trend of having more and more multilevel inverters. This paper has focused on multilevel inverter circuit topology, control, and applications, there is other research and development in related areas, such as high-voltage high-power semiconductor devices, sensors, high-speed DSPs, thermal management, and packaging. It is difficult to include all the related technologies in one paper; however, those technologies related to multilevel inverter development should not be neglected from the upcoming research.

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