IEEE IES Distinguished Lecture
Departamento de Ingniería Eléctrica, University of Malaga

Dodecagonal Space Vector Structure with Scalable 24-stepped Phase Voltage for full operating range for Medium Voltage Induction Motor Drive

Research Seminar by Prof. Gopakumar

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Salón de Grados B
Escuela de Ingenierías, Universidad de Málaga

Abstract

In this lecture, a multilevel dodecagonal voltage space vector structure with nineteen concentric dodecagons is proposed, by cascading two sets of asymmetric three level inverters with isolated H-Bridges on either side of an open-end winding induction motor. The dodecagonal structure is made possible by proper selection of DC link voltages and switching states of the inverters. The proposed scheme retains all the advantages of multilevel topologies as well the advantages of dodecagonal voltage space vector structure. In addition to that, a generic and simple method for calculation of PWM timings using only sampled reference values (v_{alpha} and v_{beta}) is proposed. Also, a new method of switching technique is proposed, which ensures minimum switching while maintaining the linearity between modulating signals and the output phase voltages. This enables the scheme to be used for any closed loop application like vector control. It also produces a 24 stepped phase voltage waveform for the entire modulation range thereby reducing the number of switchings of the inverter modules. Experimental results for steady state and transients including start-up have been presented and the results of Fast Fourier Transform (FFT) analysis is also presented for validating the proposed concept.

Resume:

K. Gopakumar received the B.E., M.Sc. (Engg.), and Ph.D. degrees from the Indian Institute of Science, Bangalore, India, in 1980, 1984, and 1994, respectively. He was with the Indian Space Research Organization, Bangalore, India from 1984 to 1987. He currently holds the position of professor at the Department of Electronic Systems Engineering, Indian Institute of Science. Dr. Gopakumar is a Fellow of IEEE, Fellow of Institution of Electrical and Telecommunication Engineers, India and Fellow of Indian National Academy of Engineers. He is currently an Associate Editor of IEEE Transaction on Industrial Electronics and also a Distinguished Lecturer of IEEE Industrial Electronics Society(IES). His research interests include PWM converters and high power drives.