Computational Technique for Modelling of Frequency Converters and Analysis of Generated Waveforms

Mr. Juan Sagarduy Ochoa de Eribe[1] Prof. Anthony J. Moses[1] Dr. Fatih J. Anayi[1]

Prof. Jon Clare[2] Dr Patrick W. Wheeler[2]

[1] Wolfson Centre for Magnetics.
Cardiff School of Engineering.
Queen's Buildings - The Parade. PO Box 925.
Cardiff CF24 3AA.
United Kingdom.
E-mail: SagarduyochoadeeribeJ@Cardiff.ac.uk
Phone: (0044) 29 2087 6046
Fax: (0044) 29 2087 6729

[2] Power Electronics and Machines Control Group.
School of Electrical and Electronic Engineering.
The University of Nottingham.
Nottingham NG7 2RD.
United Kingdom.
E-mail: Jon.Clare@nottingham.ac.uk
Phone: (0044) 115 951 5600
Fax: (0044) 115 951 5161

Abstract

Iron losses due to flux harmonics in stator cores of Pulse-Width-Modulation [PWM] inverter-fed induction motors have been highlighted recently as having a major effect on system efficiency. A new generation of direct ac-ac matrix converters offer important advantages over classical frequency converters such as absence of bulky and temperature sensitive dc-link, adjustment of power factor and nearly sinusoidal input/output current.

The method proposed here, using S-functions in a Matlab-Simulink environment, and Day Post Processor in Ansoft Simplorer, aims for a thorough analysis of output voltage waveforms of PWM inverters and 3x3 matrix converters under Space Vector Modulation [SVM]. After a brief introduction to frequency converters, the paper describes the new method and presents voltage waveforms along with analytical results of their harmonic characteristics. It is believed that as well as high processing speed and limited computational effort, this technique will provide the academic and research community with a better understanding of waveform characteristics of novel and classical ac-ac converters.