Student & Young Professionals Forum
Talk 1

Variable Speed AC Drives with Inverter Output Filters

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The electric drive is a multidisciplinary problem due to the complexity of the contained systems. The high performance and high efficiency of electric drives can be obtained only in the case of using controllable variable speed drives with sophisticated control algorithms. In the industry, the widely used adjustable speed electrical drives are systems with an induction motor and voltage inverter. The inverter output voltage has a rectangular shape and causes high rates of rises of dv/dt so in many applications it is necessary to apply filters between the inverter and the motor. The filter use at the inverter output can strongly influence on the proper operation of advanced drive control systems. The application of an inverter output filter have to be considered in the control algorithm and estimation procedures.

The tutorial explains the problem of drive systems with output filters, justifying the need for their application. Moreover, the aim of this tutorial is also to present a way to control a squirrel cage induction motor and estimation of variables by considering the presence of the output filter, especially for drive systems without speed measurement.

Jaroslaw Guzinski received M.Sc., Ph.D. and D.Sc. degrees from the Electrical Engineering Department at Technical University of Gdansk, Poland in 1994, 2000 and 2011 respectively. Since 2016 he is Associate Professor at Gdansk University of Technology. Currently he is the head of the Department of Electric Drives and Energy Conversion. From 2006 to 2009 he was involved in European Commission Project PREMAID Marie Curie, 'Predictive Maintenance and Diagnostics of Railway Power Trains', coordinated by Alstom Transport, France. From 2010 to 2014 he was a consultant in the prestigious project of integration of renewable energy sources and smart grid for building unique laboratory LINTE^2.

In 2012 he was awarded by Polish Academy of Sciences – Division IV: Engineering Sciences for his monograph "Electric drives with induction motors and inverters output filters - selected problems". He obtained scholarships in the Socrates/ Erasmus program, and was granted with three scientific projects supported by the Polish government in the area of sensorless control and diagnostic for drives with LC filters. He has authored and co-authored more than 150 journal and conference papers. He is an inventor of some solutions for speed sensorless drives with LC filters (six patents). His interests include sensorless control of electrical machines, multiphase drives (5-phase), inverter output filters, renewable energy, and electrical vehicles. Dr. Guzinski is a Senior Member of IEEE.