



SPECIAL LECTURE

The Promising Future of Integrated Motor Drives in Tomorrow's E-Mobility Application

Resource Person

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Research Interests

- Power Electronics
- Adjustable-speed Drives
- Automotive and Aerospace Electric Systems
- Electric Machines and Actuators
- Brushless Motor Drives and Generators

Biography

- 1974 MS/BS degree, Massachusetts Institute of Technology(MIT)
- 1978 PhD degree, Massachusetts Institute of Technology(MIT)
- 1998 University of Wisconsin-Madison Professor of Power Electronics and Electric Machines
- 2007-2021 Co-Director/Director of the Wisconsin Electric Machines and Power Electronics Consortium (WEMPEC)
- 2021 Grainger Emeritus Professor

Awards

IEEE Nikola Tesla Technical Field Award(2005), IAS Outstanding Achievement Award (2011), Director on the IEEE Board of Directors(2001-2002), member of the US National Academy of Engineering(2015), received the IEEE Medal in Power Engineering(2022), etc.

Abstract

The electrification of all modes of transportation holds great potential for significantly reducing global fossil fuel consumption and greenhouse gas emissions. A promising strategy for spurring much broader adoption of adjustable-speed motor drives is to physically integrate the power electronics inside electric machines, achieving major mass, volume, and cost reductions by eliminating separate enclosures and connecting cables. This tutorial explores the past, present, and future of integrated motor drives (IMDs) by first reviewing past and recent milestones in IMD developments including the underlying technologies that have both enabled and constrained them. Attention is next turned to transformative advances in wide-bandgap (WBG) power semiconductor technology (SiC and GaN) that offer exciting opportunities for shrinking the size of power converters by significantly raising their operating frequencies. Looking ahead, the case will be made for using WBG switches to spark a revival of current-source inverters (CSIs) for future machine drives. Recent IMD research projects at UW-Madison covering a wide range of power ratings from 3 kW to 1 MW will be briefly reviewed. These projects will be used to highlight the impressive progress that is being made worldwide to extend the boundaries of IMD technology in demanding high-performance applications ranging from electric vehicle traction drives to electrified aircraft propulsion drives. The presentation will conclude with a review of both the opportunities and challenges presented by WBG switches for realizing the full potential of integrated motor drives during coming years.

DATE May 31st, 2023

TIME 4:00 PM - 5:00 PM

VENUE International Hall | Room 101 | Dankook University



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Wisconsin Electric Machines and Power Electronics Consortium

Electronics & Electrical Engineering
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