TUTORIAL 8

“Current Source Inverters Using SiC and GaN Wide Bandgap Devices and Comparison with Voltage Source Inverters”

SPEAKER

Bulent Sarlioglu

University of Wisconsin-Madison, USA

Most recently, with the advance of state-of-the-art wide bandgap devices, the efficiency of themotor drives can be increased significantly compared to using Si devices such as IGBTs. The 2-level voltage source inverter (VSI) is the dominant choice for motor drive applications that arecurrently in production. However, there are some serious limitations experienced by VSIs whenSi-based switches are directly replaced by WBG switches that are attributable to the extremelyhigh dv/dt at the switch output terminals. These challenges include elevated electromagneticinterference (EMI) amplitudes, motor terminal overvoltages, and bearing damage risks due todischarge currents. The emergence of WBG power devices opens opportunities for currentsource inverters (CSIs) to provide a promising alternative drive configuration for motor driveapplications

In this tutorial, the CSI will be introduced as a promising alternative approach for applying WBG switches in future motor drives that overcomes several of the key obstacles that hinder their use in conventional VSIs as well as offering some intriguing application advantages made possible by the special features of the CSI topology. The advantages and challenges of CSIs using WBG devices will be discussed. Special attention will be focused on the game-changing potential of M-BD switches in future CSI-based integrated motor drives. Finally, a comprehensive comparison between VSI can CSI with DC-voltage power source and sine voltage output will be introduced including passive components, output performance, efficiency, and volume. Two projects that applied the combination of wide-bandgap power switches and a CSI into an integrated motor drive using a high-performance PM synchronous motor will be presented as examples.

IEMDC 2025

International Electric Machines & Drives Conference

Houston, TX May 18 - 21, 2025

Registration open at:

https://www.iemdc.org

BIOS

“Current Source Inverters Using SiC and GaN Wide Bandgap Devices and Comparison with Voltage Source Inverters”

SPEAKER

Bulent Sarlioglu

University of Wisconsin-Madison, USA

Bulent Sarlioglu is a Professor at the University of Wisconsin-Madison and the Associate Director of the Wisconsin Electric Machines and Power Electronics Consortium. From 2000 to 2011, he was with Honeywell International Inc.'s Aerospace Division, Torrance, CA, USA, most recently as a Staff Systems Engineer. His expertise includes electrical machines, drives, and power electronics, particularly in electrifying transportation and industrial applications. He is the inventor or co-inventor of 20 U.S. patents and many international patents. In addition, he has more than 300 technical papers that are published in conference proceedings and journals. Dr. Sarlioglu received Honeywell's Outstanding Engineer Award in 2011 for his outstanding contribution to aerospace, the NSFCAREER Award in 2016, and the 4th Grand Nagamori Award from Nagamori Foundation, Japan, in 2018. Dr. Sarlioglu is involved in many IEEE activities. He served as the Chair of the PES Motor Subcommittee, Chair of the IAS Transportation Committee, Educational Activity Chair of the PELS TC4Electrical Transportation Systems, and one of the co-editors of the IEEE Electrification Magazine. Dr.Sarlioglu was nominated and selected to become a Distinguished Lecturer for the IEEE Vehicle Technology Society (2021-Present) and IEEE Industrial Application Society (2019-2021). Dr. Sarlioglu received the IEEE PES Cyril Veniott Award in 2021. Dr. Sarlioglu became a fellow for the National Academy of Inverters in 2021 and an IEEE Fellow in 2022.

IEMDC 2025

International Electric Machines & Drives Conference

Houston, TX May 18 - 21, 2025

Registration open at:

https://www.iemdc.org