

ICEM'2022 TUTORIAL

TUTORIAL NAME:

Advances in Control Technologies for Brushless Doubly-fed Induction Generators

TUTORIAL PRESENTERS (Full Names, affiliations and e-mails) (Max 2):

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BIOS OF THE PRESENTERS (max 150 words each):



Yi Liu received his B.E. and M.E. degrees in Automation and Control Engineering from the Wuhan University of Science and Technology, Wuhan, China, in 2004 and 2007, respectively; and his Ph.D. degree in Mechatronic Engineering from the Huazhong University of Science and Technology, Wuhan, China, in 2016. His current research interests include multi-port electrical machines and drive systems.

From July 2016 to October 2019, he was a Postdoctoral Research Fellow at the State Key Laboratory of Advanced Electromagnetic Engineering and Technology, Huazhong University of Science and Technology, where he has been a Lecturer since January 2020. He is IEEE senior member, Vice Chair for IEEE IES Wuhan Chapter, the Associate Editor for IEEE Transactions on Industry Applications. He has published two monographs on the control of brushless doubly-fed inductor generators. He has received one IEEE Transactions Prize Paper Award in 2020.



Wei Xu received the B.E. and M.E. degrees from Tianjin University, China, in 2002 and 2005, and the Ph.D. from the Institute of Electrical Engineering, Chinese Academy of Sciences, in 2008, all in electrical engineering. His research topics mainly cover design and control of linear/rotary machines.

From 2008 to 2012, he made Postdoctoral Fellow with University of Technology Sydney, Vice Chancellor Research Fellow with RMIT University, Japan Science Promotion Society Invitation Fellow with Meiji University, respectively. Since 2013, he has been full professor with Huazhong University of Science and Technology. He is Fellow of the Institute of Engineering and Technology. He is General Chair for 2021 International Symposium on Linear Drives for Industry Applications and 2023 IEEE International Conference on Predictive Control of Electrical Drives and Power Electronics. He has been Associate Editor for several IEEE Journals. He has 14 awarded papers in the field of electrical machines and drives.

ABSTRACT (max 200 words):

This tutorial will focus on high-performance control technologies for BDFIGs. It will begin with the introduction of BDFIGs' research development and current industrial applications. And then, operation principle, mathematical models and the basic control techniques of BDFIGs will be described in detail. Moreover, the impact of special loads (e.g., unbalanced and nonlinear loads) on standalone BDFIGs will be discussed, and some compensation control methods for the BDFIGs supplying special loads will be presented by utilizing the machine side converter, or the line side converter or both of them. Also, two advanced control strategies for the standalone BDFIG under heavy load disturbance based on the single power converter and on the dual power converters are developed, respectively. Then two predictive control methods will be introduced for the improvements of the robustness and dynamic response for the standalone BDFIG system. Besides, sensorless control for BDFIG is also an important content in this tutorial, in which two rotor position observers and five model reference adaptive system (MRAS) control strategies for BDFIG will be presented. Finally, main conclusions are drawn in detail.