

ICEM 2024, Torino, September 1-4 2024

## Tutorial Proposal

### TUTORIAL TITLE:

Industrial medium-voltage drives: from components to systems and applications

### TUTORIAL PRESENTER:

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### BIOS OF THE PRESENTER:

Tobias Geyer is a Corporate Executive Engineer at ABB System Drives in Switzerland and R&D platform manager of the ACS6000 and ACS6080, the most well-known medium-voltage drive in industry. His research interest are high-power converters and drives, optimized pulse patterns and model predictive control. Dr. Geyer received the Ph.D. in control theory and the Habilitation degree in power electronics from ETH Zurich in 2005 and 2017, respectively. He was appointed as an extraordinary professor at Stellenbosch University in 2017 and has been teaching a course at ETH Zurich since 2016.

He has received five IEEE prize paper awards, filed about 90 patents and co-authored more than 170 peer-reviewed publications. He has organized about 15 tutorials at international conferences and has given 8 keynote lectures. Dr. Geyer has co-supervised more than 25 students, among them 8 PhD students. He is a former distinguished lecturer of PELS and a former associate editor of the Transactions on Power Electronics. Dr. Geyer is a Fellow of the IEEE.

### ABSTRACT:

Medium-voltage drives are vital in decarbonizing the planet by generating renewable energy and electrifying transportation systems and heavy industry. This tutorial provides a comprehensive introduction, overview and assessment of such drives. A particular emphasis is laid on system aspects, integrating the transformer, converter, electrical machine and load into a high-performance drive system that is scalable, reliable and cost competitive.

To minimize the cost of such drive systems - or conversely - to maximize their hardware capability in terms of rated voltage and current, model predictive pulse pattern control (MP3C) offers a disruptive way of achieving this, as will be shown in this



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tutorial. The classic control methods, scalar control, field-oriented control and direct torque control will be introduced as well.

Medium-voltage drives are highly tailored to their specific application. As such, the understanding of the key drive applications is vital, including Marine propulsion, rolling mills of the Metals industry, crushers and mine hoists of the Mining industry, Wind power generation, and pumps and compressors used in the Oil and Gas industry.

This tutorial will introduce the exciting world of medium-voltage drive systems, it will showcase the opportunities they offer, will briefly introduce the quickly growing field of non-motoric applications and will point out challenging research problems for academics and researchers in industry alike.

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