

Keynote speech:

## Challenges of Modern AC Motor Traction Drives

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**Zdeněk Peroutka** received the Master's and Ph.D. degrees in electrical engineering from the University of West Bohemia (UWB), Pilsen, Czech Republic, in 2000 and 2004, respectively. He is a Full Professor of power electronics and drives and the Vice Dean for science and strategy with the Faculty of Electrical Engineering, UWB. From October 2010 to June 2016, he was a Scientific Director and Principal Investigator of the R&D center RICE at UWB. Since July 2016, he has been a CEO and Principal Investigator of the R&D center RICE. He has published more than 200 papers in international journals and conference proceedings. He is the inventor of two international patents and two utility models. His main research topic is control of drives of modern transport systems and vehicles and power electronics converters for medium-voltage applications.

### Abstract:

Research of modern ac motor traction drives brings many challenges including a drive concept, a design of particular drive components, a drive and vehicle control, interactions of a vehicle with its environment, etc. One of the most important characteristics of a traction drive is its reliability and safety. Thus, the experimental testing and validation are important part of the research of new traction drive technologies. R&D center RICE opened in June 2016 in Pilsen, Czech Republic a world unique laboratory for transportation systems and medium-voltage power electronics. Its technology will be briefly discussed in the first part of this contribution. A drive concept is a big issue to be discussed in the next part of the presentation. There exist many solutions from conventional wheel-set/axle drives with gearbox to either direct axle or wheel drives. Many solutions have been introduced specifically in light traction vehicles, where full low-floor design is a standard requirement at present. The main research challenge is the significant reduction of the weight and volume of the traction drive unit while keeping its tractive effort, long lifetime and as low as possible cost. A design of power electronics converters is the next big issue which will be discussed in the third part of this contribution. New packages (such as XHP) and new power electronics devices (specifically with wide bandgap semiconductors) require new concepts of converter design. The last part of this presentation will be dedicated to a traction drive control. A control has to provide the traction drive not only with excellent dynamics, but it must also secure the drive stability and appropriate interaction between the drive and a supplying system. Application of optimal control theory, specifically model predictive control techniques, in modern ac motor traction drives will be discussed.