IEEE IA/PELS Mini-Colloquium on Emerging Industry Applications and Power Electronic Challenges
IEEE IA/PELS DL-MQ

Singapore University of Technology and Design (SUTD), Lecture Theatre 1 (LT1)
1st June 2016, 1:30 pm – 5:00 pm

IEEE IA/PELS DL-MQ surrounds the theme on Motor Drives Applications, addressing challenging areas like high-speed lifts, renewable power systems, electric transporters, more electric aircrafts, etc. and targets to

(1) bring knowledge to students;
(2) gather experts to address challenging questions; and
(3) expose IEEE IA/PELS to potential members.

Programme

1:30 pm: Welcome speeches
2:00 pm: Lecture by IEEE Distinguished Lecturer (incl Q&A)
3:00 pm: Invited Talks (incl Q&A)
4:00 pm: Networking session over high-tea and SUTD tour

The mini-colloquium is open to all and should you or your colleagues be interested, please register via the doodle link: http://doodle.com/poll/9tgpnan4ggzuyznr so that we can better to cater the refreshment for you.

2:00 - 3:00 pm: Lecture by IEEE Distinguished Lecturer (incl Q&A)	
TOPIC	**Hardware-in-the-Loop Systems With Power Electronics – a Powerful Simulation Tool**
SPEAKER	Professor Ralph M. Kennel Electrical Drive Systems and Power Electronics, Department of Electrical and Computer Engineering, Technische Universität München, Germany

SYNOPSIS

The lecture presents an interesting approach for Power-Hardware-in-the-Loop (PHiL) testing of voltage source inverters for drive applications. For this purpose the inverter under test is not connected to a real machine, but to a second inverter instead, which behaves like an electrical machine. The power capability of the so-called"Virtual Machine" is increased by sequential switching of parallel connected standard inverters. The parallel connected inverters can be of the same type as the inverter under test. As the "Virtual Machine" can be scaled, there is no practical power limitation for drive inverter testing with respect to the product range of the manufacturer.

ABOUT THE SPEAKER

Ralph M. Kennel was born in 1955 at Kaiserslautern (Germany). In 1979 he got his diploma degree and in 1984 his Dr.-Ing. (Ph.D.) degree from the University of Kaiserslautern.

From 1983 to 1999 he worked on several positions with Robert BOSCH GmbH (Germany). Until 1997 he was responsible for the development of servo drives. Dr. Kennel was one of the main supporters of VECON and SERCOS interface, two multi-company development projects for a microcontroller and a digital interface especially dedicated to servo drives. Furthermore he took actively part in the definition and release of new standards with respect to CE marking for servo drives.

Between 1997 and 1999 Dr. Kennel was responsible for "Advanced and Product Development of Fractional Horsepower Motors" in automotive applications. His main activity was preparing the introduction of brushless drive concepts to the automotive market.

From 1994 to 1999 Dr. Kennel was appointed Visiting Professor at the University of Newcastle-upon-Tyne (England, UK). From 1999 - 2008 he was Professor for Electrical Machines and Drives at Wuppertal University (Germany). Since 2008 he is Professor for Electrical Drive systems and Power Electronics at Technische Universitaet Muenchen (Germany). His main interests today are: Sensorless control of AC drives, predictive control of power electronics and Hardware-in-the-Loop systems.

Dr. Kennel is a Senior Member of IEEE, a Fellow of IET (former IEE) and a Chartered Engineer in the UK. Within IEEE he is Treasurer of the Germany Section as well as Distinguished Lecturer of the Power Electronics Society (IEEE-PELS).
Dr. Kennel has received in 2013 the Harry Owen Distinguished Service Award from IEEE-PELS as well as the EPE Association Distinguished Service Award in 2015.

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3:00 - 4:00 pm: Invited Talk #1 (incl Q&A)	
TOPIC	**A Truly Universal AC Drive**
SPEAKER	Dr. Loh Wai Kuan Technical Director, Control Techniques, Emerson Industrial Automation

SYNOPSIS

A universal variable speed AC drive is described that in addition to the basic drive, which can control asynchronous or synchronous motors, has many additional features required for a wide range of applications. The drive is able to control asynchronous or synchronous motors in closed loop with encoder and without encoder feedback. A novel indirect voltage sensing method to give supply voltage synchronization is described in some detail. This enables a standard drive to be used as a PWM rectifier without any additional supply voltage feedback hardware.

The power rating ranges from 0.37kW to 2.8MW. High power rating, beyond 350kW, is created by paralleling power modules with output sharing chokes. The master power module send PWM signals to the slave power modules, with up to 10 modules in parallel.

The author will illustrate the versatility and usefulness of such products with real applications. He will also demonstrate a model of such product.

ABOUT THE SPEAKER

Dr. Loh Wai Kuan graduated from University of Manchester Institute of Science and Technology (UMIST) with BSc, MSc and PhD. He worked on inverter for electric vehicle in his post graduate thesis. He was a lecturer in Singapore Polytechnic for 4 years, where he designed the curriculum for the Power Electronics Course at Diploma and Advanced Diploma levels. He left Singapore Polytechnic to work with Control Techniques as R&D Manger, where he developed a range of single phase inverters. Dr. Loh then moved on to system engineering, designing automation system based on Control Techniques variable speed drive products.

Control Techniques is a business unit of Emerson Industrial Automation. He is now the Technical Director, involved in training and developing the competency of the engineering teams for Control Techniques group of companies and distributors in Asia Pacific.

Dr. Loh has worked in many process and manufacturing automations. He has experiences in hot rod mill, cold rolling, paper mill, winder and un-winder, slitter, rotary cutter, flying shear, plastic film, elevator, port cranes and many different types of motion control systems. He has experience in soft-starters, AC and DC drives, from fractional kW to mega kW. For the past 2 years, he has been involved with the sizing, installation and commissioning of mega kW grid-tie solar inverters.

Dr. Loh is a Chartered Engineer, UK, Member of IET, Member of IEEE and Senior Member of IES.

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3:00 - 4:00 pm: Invited Talk #2 (incl Q&A)	
TOPIC	**Electric Drives for Aerospace Applications**
SPEAKER	Adj. Assoc. Prof. Amit K. Gupta Chief of Electrical Power and Control Systems at Rolls-Royce Singapore Pte. Ltd.

SYNOPSIS

The power electronic converters and electrical machines play a critical role in modern aircraft. Power density, reliability, weight, volume and fault tolerance are of key importance for aerospace related electrical machines and drives. Adopting electrical machine drive systems in More Electric Architecture (MEA) eliminate hydraulic, pneumatic and gearbox driven subsystems which results in reduced overall aircraft weight, increased reliability, significant cost reduction due to fewer parts, reduced fuel consumption and maintenance. Recent improvements in technology incorporates no-bleed air environmental control schemes, variable-frequency and dc power-distribution buses, and electrical actuation. The development of high performance integrated starter/generator (S/G) is the key component of the electrical system which provides the necessary starting functions for the main engine and deliver high quality electrical power to aircraft loads. To obtain optimum performance during the starting period, the power electronic converters with the necessary power densities, reliability are used to provide a variable voltage and variable frequency conditioned power. The high-performance machines for aerospace applications typically drive high speed compressors, fans, pumps, and actuation systems. The fault tolerant electric motor is very suitable for an main engine fuel pump drive. In recent years, many research has been conducted to improve the reliability and power density of the converter. New developments of wide-bandgap semiconductor-based power devices will allow reducing electrical losses, weight, and volume.

ABOUT THE SPEAKER

Amit K. Gupta, (S'04-M'08-SM'12) holds a Bachelor degree in electrical engineering from Indian Institute of Technology (IIT)-Roorkee and a Ph.D. degree in Electrical Engineering from National University of Singapore. He has 16 years of experience in the field of electrical engineering. Since August 2012, he is working with Rolls-Royce Singapore Pte Ltd as Chief of Electrical Capability Group. Till date he has been granted 12 patents and applied for another 26 patents. He has published more than 40 papers in international conferences and journals. He is also an Adjunct Faculty with ECE, NUS and EEE, NTU. He holds a six sigma Green Belt Certificate from Delphi Automotive Systems and trained in six sigma Black Belt techniques through Vestas Wind Systems. His research interests include power electronics, drives and power systems. He is a recipient of Vestas Innovation excellence award for being top 5 innovators of Vestas Global Research. He is a recipient of the Prize paper from the IEEE Industrial Applications Society's (IAS) and Industrial Power Converter Committee (IPCC) for 2005."

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Directions to SUTD Lecture Theatre 1

By Train

Alight at Expo MRT station and walk to our campus - along Changi South Avenue 1 in the direction of Max Pavilion/Somapah Road

By Bus

Alight at one of the bus stops along Upper Changi Road East and walk to our Campus:

- B96041: Upper Changi Road East, Before Tropicana Condo. Service No: 2, 5, 24
- B96049: Upper Changi Road East, Opposite Tropicana Condo. Service No: 2, 5, 24

By car

From ECP:

Take Exit 2B on ECP (Xilin Ave towards Tampines)
Turn right to Changi South Ave 3
Turn left to Changi Business Park Vista
Turn right to Changi South Ave 1
Turn left into the Campus carpark (before the sports complex)

From PIE:

Take Exit 4A on PIE (Simei Ave)
Turn left to Upper Changi Road East
Turn right to Somapah Road
Turn left to Changi South Ave 1
Turn left into the Campus carpark (before the sports complex)