IEEE

Conference Program for the

2004 IEEE Industry Applications Conference

39th IAS Annual Meeting

Seattle

IAS IEEE INDUSTRY APPLICATIONS SOCIETY

October 3-7, 2004

Westin Hotel • Seattle, Washington

www.ewh.ieee.org/soc/ias/

visit us online at www.ewh.ieee.org/soc/ias/

City of Seattle • Office of the Mayor

GREETINGS

October 3, 2004

Greetings!

On behalf of the citizens of Seattle, it is my pleasure to welcome you to the Industry Applications Society of the Institute of Electrical and Electronic Engineers' 2004 Annual Meeting.

I commend the Industry Applications Society (IAS) for the leadership it has shown in promoting safety, reliability, energy conservation, environmental health and safety within the engineering field. IAS not only plays a tremendous role in the advancement of technology but supports the professional development of its members.

During this conference, you will have opportunities to learn from some of the brightest engineers in the world, network with other professionals and meet future leaders in the engineering field at the Myron Zucker Awards Luncheon.

It is fitting that you chose to convene this year's meeting in Seattle. The city has a long history of innovation and is proud to be the home of outstanding companies in the biomedical technology, telecommunications, aerospace and consumer electronics fields.

I hope that you have time during your stay to enjoy all our wonderful attractions. I recommend touring Pike Place Market and the waterfront, strolling through one of the several great museums or taking a trip up the Space Needle.

Best wishes on a great conference. We're happy to have you here!

Sincerely,

GREG NICKELS
Mayor of Seattle

Chairman's Welcome

Erling Hesla
Seattle Committee Chair

Lanny Floyd
Conference Chair
IAS President Elect

Welcome to Seattle

Over the past 15 years, the two of us have enjoyed collaborating on a number of projects within the technical and regional activities of the Industry Applications Society. Working together to bring you the 39th Annual Meeting has been a real pleasure.

The IAS Annual Meeting provides an outstanding venue for learning and career advancement. Throughout the week, innovative solutions developed by industry and academia are presented for industry applications. With an exceptional professional continuing education, the Meeting starts off with 6 tutorials on Sunday. CEUs are offered for those needing verification of continuing education. From Monday to Thursday, the technical program features over 400 papers from authors around the world. On Monday, more than 40 Technical Committee meetings and Standards Working Group meetings take place, offering many opportunities for getting involved in the various technical activities of the IAS. Throughout the week, you will see displays of IAS and IEEE activities, products and services in the common area of the Westin hotel.

We feel the social activities of the meeting enable the development of community and professional relationships key to career success. The Sunday evening reception provides a place to catch up with old friends and make new ones. The Tuesday Awards Luncheon highlights Chapters and Prize Paper Awards, and the Wednesday evening President's banquet will honor recipients of the Society's most prestigious awards, IEEE awards, and newly-elected IEEE Fellows.

Last but not least we believe you will find the Westin is within walking distance of many fine restaurants, shopping, theater, the famous Pike Place Market, ferries, and many other attractions. Seattle is a beautiful city and we hope that you take the opportunity to enjoy the beauty and local culture.

On behalf of the Seattle Conference Committee and the IEEE Industry Applications Society, we welcome you to Seattle and the 39th Annual Meeting of the Industry Applications Society

Erling Hesla
Seattle Committee Chair

Lanny Floyd
Conference Chair
IAS President Elect

President's Welcome

39th IAS Annual Meeting

The IEEE Industry Applications Society welcomes you to our 39th Annual Meeting. The IAS Annual Meeting is our main event, and we hope that its activities will allow you to experience the depth and breadth of the Society. The outstanding technical program assembled this year provides an opportunity for engineers from academia and industry to interact and share information and ideas. I hope that you will renew old acquaintances, make new acquaintances, and get involved in the many technical committees and working groups that are meeting during the week. The IAS and its committees welcome your participation.

The Society will recognize the accomplishments of IAS chapters and members this week. The Society's highest awards – Distinguished Service, Outstanding Achievement, and Outstanding Young Member – will be presented at the President's banquet on Wednesday evening. Society Prize Paper Awards, Myron Zucker Student Design Contest winners, newly-elected IEEE Fellows, and outstanding chapter awards will be presented at the Awards Luncheon on Tuesday.

Enjoy the conference and Seattle!

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IAS President

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IEEE - IAS Executive Board

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Contents

Registration Hours

Sunday, October 3, 2004

IEEE IAS Conference Registration
Grand Level – Grand Foyer
7:00 am – 7:00 pm

Monday, October 4, 2004

IEEE IAS Conference Registration
Grand Level – Grand Foyer
7:00 am – 6:00 pm

Tuesday, October 5, 2004

IEEE IAS Conference Registration
Grand Level – Grand Foyer
7:00 am – 3:00 pm

Wednesday, October, 6, 2004

IEEE IAS Conference Registration
Grand Level – Grand Foyer
7:00 am – 6:30 pm

Thursday, October 7, 2004

IEEE IAS Conference Registration
Mezzanine Level – Cascade Foyer
7:00 am – 12:00 pm

Conference Amenities

Author's Breakfast

An Author's Breakfast will be held each morning from 7:00 am – 8:00 am in the following locations:

Monday – Grand I
Tuesday – Grand III
Wednesday – Grand II
Thursday – Grand I

All rooms are located on the Grand Level in the hotel. All authors are requested to attend this brief but crucial meeting on the day of their paper presentation only for important instructions and announcements.

Guest Hospitality Suite

There will be a hospitality suite available to all guests for refreshments and networking during these hours:
Sunday, 12:00 pm – 6:00 pm
Monday, 7:00 am – 6:00 pm
Tuesday, 7:00 am – 6:00 pm
Wednesday, 7:00 am – 6:00 pm
Thursday, 7:00 am - 12:00 pm

The Guest Hospitality will be located in the Seattle Suite on the 39th Floor of the South Tower. There will not be formal food and beverage available in the afternoon this year.

Daily Conference Breaks

San Juan Level – San Juan Foyer
Mezzanine Level – Cascade Foyer

AM Breaks	10:00 am – 10:30 am
PM Breaks	3:00 pm – 3:30 pm

Special Events

(Tickets required for all special events)

Sunday
Welcome Reception
6:00 pm – 7:00 pm
Grand II & III
Cocktails and light snacks, dinner will not be provided.

Monday
Myron Zucker Student Luncheon
12:00 pm – 2:00 pm
Grand I

Tuesday
IEEE IAS Awards Luncheon
12:00 pm – 2 pm
Grand III

Wednesday
IEEE IAS President's Reception & Banquet

6:30 pm – 7:30 pm Reception
Grand Foyer

Reception Entertainment:
Caricaturist: *"The exaggeration of things that are actually present"* This caricaturist's years of experience have given his drawings a detailed and humorous quality that is always a crowd pleaser. His caricatures exhibit both exacting perceptual and free expressive qualities, along with an irreverently honest and playful portrayal of one's prominent features.

Strolling Magician: Strolling Close-Up Magic is the art of entertaining an audience one small group at a time. It is a wonderful ice-breaker & crowd-pleaser during a social or cocktail hour. An award winning Magic Shows professional for 25 years, this magician has appeared on the internationally viewed PBS television special, The Art of Magic.

Strolling Juggler: This juggler's strolling act has a style that is folksy, comedic, engaging, and interactive. A long time performer in Branson, MO, this juggler calls his brand of juggling *Branson Style*, which is clean. Light hearted and funny, this act is sure to please.

7:30 pm – 9:30 pm Banquet
Grand II & III
Banquet Entertainment:
Emmanuel del Casal Jazz Quartet

Schedule At A Glance

Sunday, October 3, 2004

IEEE IAS Conference Registration	Grand Foyer/Grand Level	7:00 am - 7:00 pm
Guest Hospitality: IEEE IAS Guest Hospitality Suite	Seattle Suite	12:00 pm - 6:00 pm
Tutorials		
Tutorial #1: Analysis, Design, and Control of Interior Permanent Magnet Synchronous Machines	Grand Crescent	8:00 am - 5:00 pm
Tutorial #2: Electric Drives and Their Control: From Understanding Basics to Designing for Advanced Control and Encoder-Less Operation	Vashon	8:00 am - 5:00 pm
Tutorial #3: AC and DC Drive/Motor Selection in Industrial Applications	Cascade IA	8:00 am - 5:00 pm
Tutorial #4: Understanding Failure Modes, Protection, and Reliability of IndustrialPower Converters	Cascade IB	8:00 am - 12:00 pm
Tutorial #5: Forensic Electrical Engineering: Engineering, Medical, and Legal Aspects	Cascade IB	1:00 pm - 5 :00 pm
Tutorial #6: Servo Drives	Cascade IC	8:00 am - 12:00 pm
Committee Meetings		
Power Electronics Society AdCom Meeting	Olympic	7:30 am - 5:00 pm
Technical Books Coordination Committee	Blakely	2:00 pm - 4:00 pm
Industrial Power Conversion Systems Department	Blakely	8:00 pm - 10:00 pm
Future Energy Challenge	Cascade IC	1:00 pm - 4:00 pm
Power System Protection Executive Committee	Stuart	4:00 pm - 5:00 pm
Power System Engineering Executive Committee	Orcas	4:00 pm - 5:00 pm
Orange Book Working Group	Whidbey	1:00 pm - 4:00 pm
Gold Book Working Group	Whidbey	4:00 pm - 6:00 pm
IAS Executive Board Committee Meetings	Cascade II	7:30 am - 5:00 pm
Special Event: IEEE IAS Welcome Reception	Grand II & III	6:00 pm - 7:00 pm

Monday, October 4, 2004

IEEE IAS Conference Registration	Grand Foyer/Grand Level	7:00 am - 6:00 pm
Author's Breakfast	Grand I	7:00 am - 8:00 am
Guest Hospitality: IEEE IAS Guest Hospitality Suite	Seattle Suite	8:00 am - 6:00 pm
Committee, Subcommittee and Working Group Meetings		
Forensics Working Group	Blakely	8:00 am - 10:00 am
Yellow Book Working Group	Blakely	10:00 am - 11:00 am
Maintenance, Operation, and Safety Subcommittee	Blakely	11:00 am - 12 noon
Power System Engineering Technical Program Luncheon	Blakely	12:00 pm - 1:30 pm
Emergency and Standby Power Systems Subcommittee	Blakely	1:30 pm - 2:30 pm
Bronze Book Working Group	Blakely	2:30 pm - 3:30 pm
Utility Deregulation Subcommittee	Blakely	3:30 pm - 4:30 pm
Energy Systems Committee	Blakely	4:30 pm - 6:00 pm
Green Book Working Group	Orcas	8:00 am - 9:00 am
Grounding Subcommittee	Orcas	9:00 am - 10:00 am
Red Book Subcommittee	Orcas	10:00 am - 12:00 pm

Reliability Subcommittee	Orcas	1:30 pm - 2:30 pm
Design Subcommittee	Orcas	3:30 pm - 4:30 pm
Power System Engineering Committee	Orcas	4:30 pm - 6:00 pm
Blue Book Working Group	Baker	8:00 pm - 9:00 am
Buff Book Working Group	Baker	9:00 am - 10:00 am
Generator Grounding Working Group	Baker	10:00 am - 11:00 am
Bus and Breaker Failure Working Group	Baker	11:00 am - 12:00 pm
Islanding Working Group	Baker	1:30 pm - 2:30 pm
Protection and Coordination Subcommittee	Baker	2:30 pm - 3:00 pm
Medium Voltage Subcommittee	Baker	3:00 pm - 3:30 pm
Surge Protection Subcommittee	Baker	3:30 pm - 4:00 pm
Low Voltage Subcommittee	Baker	4:00 pm - 4:30 pm
Power System Protection Committtee	Baker	4:30 pm - 6:00 pm
Equipment Reliability Working Group	Adams	8:00 AM - 9:00 AM
Reliability Analysis Techniques Working Group	Adams	9:00 am - 10:00 am
Voltage Sag Working Group	Adams	10:00 am - 11:00 am
Gold Book Working Group	Adams	11:00 am - 12:00 pm
Harmonics Working Group	Adams	1:30 pm - 2:30 pm
Brown Book Working Group	Adams	2:30 pm - 3:30 pm
Power System Analysis Subcommittee	Adams	3:30 pm - 4:00 pm
Power Quality Subcommittee	Adams	4:00 pm - 4:30 pm
Emerald Book Working Group	Stuart	8:00 am - 10:00 am
White Book Working Group	Stuart	10:00 am - 11:00 am
Gray Book Working Group	Stuart	11:00 am - 12:00 pm
P1605 Working Group	Stuart	1:30 pm - 2:30 pm
P1606 Working Group	Stuart	2:30 pm - 3:20 pm
Codes and Standards Committee	Stuart	3:30 pm - 4:30 pm
Meetings Committee	Stuart	4:30 pm - 5:00 pm
Monday Technical Sessions		
Session #1: Induction Motors - 1	Cascade II	8:00 am - 12:00 pm
Session #10: Special Machines	Cascade II	1:00 pm - 5:00 pm
Session #2: Salient Pole Machines	Vashon II	8:00 am - 12:00 pm
Session #11: Switched Reluctance Machines	Vashon II	1:00 pm - 5:00 pm
Session #3: Active Power Filters	Cascade IA	8:00 am - 12:00 pm
Session #12: Industrial Power Converter (Products and Services)	Cascade IA	1:00 pm - 5:00 pm
Session #4: Inverters	Cascade IB	8:00 am - 12:00 pm
Session #13: Rectifiers	Cascade IB	1:00 pm - 5:00 pm
Session #5: Primary Metal & Caster	Vashon I	8:00 am - 12:00 pm
Session #14: Power Quality, Robot Control, & Discharge Machining	Vashon I	1:00 pm - 5:00 pm
Session #6: Current Sensing Technologies (Products and Services)	Grand Crescent	8:00 am - 12:00 pm
Session #15: Magnetic Components	Grand Crescent	1:00 pm - 5:00 pm
Session #7: Plasma Reactors	Cascade IC	8:00 am - 12:00 pm
Session #16: Plasma Chemical Processes	Cascade IC	1:00 pm - 5:00 pm
Session #8: Permanent Magnet Motor Drives	St. Helens	8:00 am - 12:00 pm
Session #17: Induction Motor Drives	St. Helens	1:00 pm - 5:00 pm
Session #9: Fluorescent Ballasts	5th Avenue	8:00 am - 12:00 pm
Session #18: HID Ballasts	5th Avenue	1:00 pm - 5:00 pm

Monday, October 5, 2004 (continued)

Committee Meetings		
Chapters Workshop	Olympic	8:30 am -5:00 pm
Metals Industry Committee	Vashon I	5:00 pm - 7:00 pm
Industrial Drives Committee	Grand Crescent	5:00 pm - 7:00 pm
Production and Application of Light Committee	5th Avenue	5:30 pm - 7:00 pm
Future Energy Challenge A	Grand II	8:30 am - 11:30 am
Future Energy Challenge B	Niko	8:30 am - 11:30 am
Special Event: IEEE IAS Myron Zucker Student Luncheon	Grand I	12:00 pm - 2:00 pm

Tuesday, October 5, 2004

IEEE IAS Conference Registration	Grand Foyer/Grand Level	7:00 am - 3:00 pm
Author's Breakfast	Grand III	7:00 am - 8:00 am
Guest Hospitality: IEEE IAS Guest Hospitality Suite	Seattle Suite	8:00 am - 6:00 pm
Tuesday Technical Sessions		
Session #19: Diagnostics	Cascade II	8:00 am - 12:00 pm
Session #28: Permanent Magnet Machines - 1	Cascade II	2:00 pm - 5:30 pm
Session #20: Power Systems Reliability	Vashon	8:00 am - 12:00 pm
Session #29: Safety and Productivity in the Mining Industry	Vashon	2:00 pm - 5:30 pm
Session #21: Multilevel Converters	Cascade IA&B	8:00 am - 12:00 pm
Session #30: DC/DC Converters	Cascade IA&B	2:00 pm - 5:30 pm
Session # 22: Design, Control, and Analysis in Power Converters	Cascade IC	8:00 am - 12:00 pm
Session # 31: Alternative Engergy Applications	Cascade IC	2:00 pm - 5:30 pm
Session# 23: Hot and Cold Rolling	Grand Crescent	8:00 am - 12:00 pm
Session# 32: Sensors, Measurements, Communication and Fault Detection	Grand Crescent	2:00 pm - 5:30 pm
Session #24: Status of High Temp. Devices and Components (Products and Services)	Grand II	8:00 am - 12:00 pm
Session #33: SiC Device and High Performance Applications	Grand II	2:00 pm - 5:30 pm
Session #25: Electrostatic Spraying and Biological Applications	Olympic	8:00 am - 12:00 pm
Session #34: Charging and Discharging	Olympic	2:00 pm - 5:30 pm
Session #26: Sensorless Permanent Magnet Motor Drives	St. Helens	8:00 am - 12:00 pm
Session #35: Sensorless Induction Motor Drives	St. Helens	2:00 pm - 5:30 pm
Session #27: Industrial Applications of Light	5th Avenue	8:00 am - 12:00 pm
Session #36: Lighting Systems	5th Avenue	2:00 pm - 5:30 pm
Committee Meetings		
IEEE IAS Annual Meeting Steering Committee	Blakely	8:00 am - 11:00 am
International Electric Machines and Drives Conference Steering Committee	Blakely	12:30 pm - 2:00pm
Industrial and Commercial Power Systems Department Operation Committee	Blakely	3:00 pm - 5:00 pm
Power Electronics Devices & Components	Blakely	5:30 pm - 7:30 pm
Transactions Advisory Board	Baker	8:00 am - 11:00 am
Magazine Advisory Board	Baker	1:00pm - 4:00 pm
P1662 Working Group - Guide for the Design and Application of Power Electronics in Electrical Power Systems on Marine Ships	Whidbey	8:00 am - 11:00 am
Publications Department Meeting	Whidbey	4:00 pm - 6:00 pm
IAS Awards Workshop	Stuart	2:00 pm - 5:00 pm
Ad Hoc Committee on IAS Power Electronics Society	Adams	2:00 pm - 6:00 pm
Electric Machines Committee	Cascade II	5:30 pm - 8:00 pm
Mining Industry Committee	Vashon	5:30 pm - 7:30 pm
Industrial Power Converter	Cascade IC	5:30 pm - 7:00 pm
Electrostatic Processes Committee	Olympic	6:00 pm - 7:00 pm
Industrial Automation and Control Committee	Grand Crescent	6:00 pm - 8:00 pm
Special Event: IEEE IAS Awards Luncheon	Grand III	12:00 pm - 2:00 pm

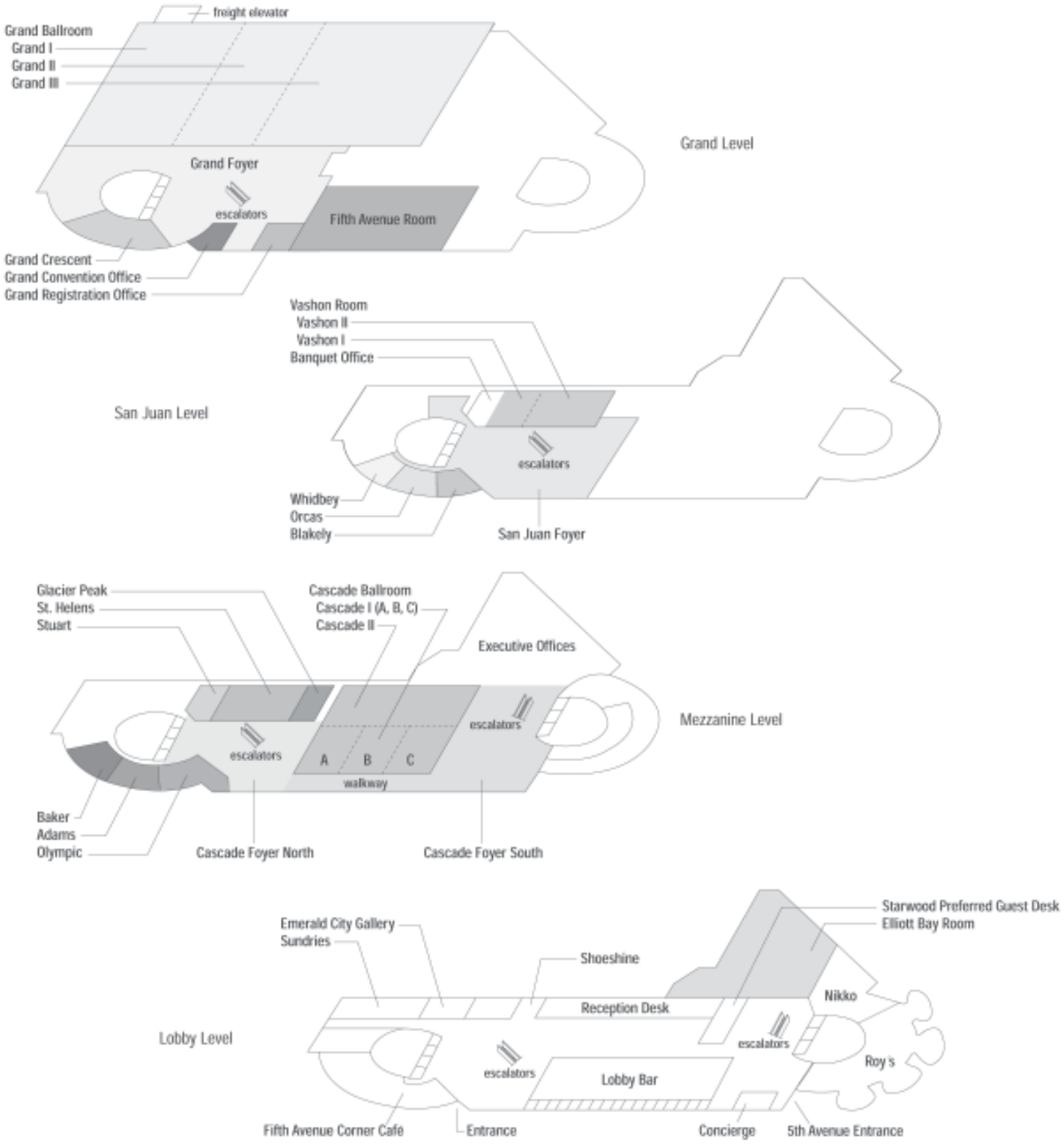
Wednesday, October 6, 2004

IEEE IAS Conference Registration	Grand Foyer/Grand Level	7:00 am - 6:30 pm
Author's Breakfast	Grand II	7:00 am - 8:00 am
Guest Hospitality: IEEE IAS Guest Hospitality Suite	Seattle Suite	8:00 am - 6:00 pm
Wednesday Technical Sessions		
Session #37: Permanent Magnet Machines - 2	Cascade II	8:00 am - 12:00 pm
Session #46: Permanent Magnet Machines - 3	Cascade II	1:00 pm - 5:00 pm
Session#38: Motor/Generator Related Technologies (Products and Services)	Vashon	8:00 am - 12:00 pm
Session #47: Power Systems Design	Vashon	1:00 pm - 5:00 pm
Session #39: Power Electronics Building Block Concepts (Panel Session)	Cascade IA&B	8:00 am - 12:00 pm
Session #48: Soft Switching and Resonant Converters	Cascade IA&B	1:00 pm - 5:00 pm
Session #40: Utility Interface and Power Quality I	Cascade IC	8:00 am - 12:00 pm
Session #49: Converter Applications and Implementation Issues	Cascade IC	1:00 pm - 5:00 pm
Session #41: Industrial Controls and Mechatronics	Whidbey	8:00 am - 12:00 pm
Session #50: Motion Controls	Whidbey	1:00 pm - 5:00 pm
Session #42: Power Modules	Grand I	8:00 am - 12:00 pm
Session #51: Device Integration Strategies	Grand I	1:00 pm - 5:00 pm
Session #43: Corona Discharging	Olympic	8:00 am - 12:00 pm
Session #52: Electrostatic Separation and Deposition	Olympic	1:00 pm - 5:00 pm
Session #44: Swiched Reluctance Motor Drives	St. Helens	8:00 am - 12:00 pm
Session #53: Drives Interface Issue	St. Helens	1:00 pm - 5:00 pm
Session #45: LED and Other Lamps	5th Avenue	8:00 am - 12:00 pm
Session #54: Energy Systems I	5th Avenue	1:00 pm - 5:00 pm
Committee Meetings		
IEEE IAS Executive Board Meeting	Grand Crescent	8:00 am - 12:00 pm
Special Events		
IEEE IAS Council Luncheon	Grand II	12:00 pm - 3:00 pm
IEEE IAS Presidents Reception	Grand Foyer	6:30 pm - 7:30 pm
IEEE IAS Presidents Banquet	Grand II & III	7:30 pm - 9:30 pm

Thursday, October 7, 2004

IEEE IAS Conference Registration	Cascade Foyer/Mezzanine Level	7:00 am - 12:00 pm
Author's Breakfast	Grand I	7:00 am - 8:00 am
Guest Hospitality: IEEE IAS Guest Hospitality Suite	Seattle Suite	8:00 am - 12:00 pm
Thrusday Technical Sessions		
Session #55: Linear Actuators	Cascade II	8:00 am - 12:00 pm
Session #64: Induction Motors - 2	Cascade II	1:00 pm - 5:00 pm
Session #56: Power Systems Analysis	Vashon	8:00 am - 12:00 pm
Session #57: PWM and Control Techniques	Cascade IA	8:00 am - 12:00 pm
Session #65: Semiconductor Models and Capacitors	Cascade IA	1:00 pm - 5:00 pm
Session #58: Utility Interface and Power Quality II	Cascade IC	8:00 am - 12:00 pm
Session #66: Power Systems Engineering and Protection	Cascade IC	1:00 pm - 5:00 pm
Session #59: Electro-Thermal Issues	Whidbey	8:00 am - 12:00 pm
Session #67: Intelligent Controls and Applications	Whidbey	1:00 pm - 5:00 pm
Session #60: Thermal Management	Cascade IB	8:00 am - 12:00 pm
Session #68: Filtering and EMI	Cascade IB	1:00 pm - 5:00 pm
Session #61: Computational Electrostatics and Electrohydrodynamics	Olympic	8:00 am - 12:00 pm
Session #69: Electrostatic Measurement and Controls	Olympic	1:00 pm - 5:00 pm
Session #62: Brushless and Synchronous Reluctance Motor Drives	St. Helens	8:00 am - 12:00 pm
Session #70: Drives Applications	St. Helens	1:00 pm - 5:00 pm
Session #63: Power Systems Protection 1	5th Avenue	8:00 am - 12:00 pm
Session #71: Energy System II	5th Avenue	1:00 pm - 5:00 pm

Hotel Floorplans



Conference Tutorials

Analysis, Design and Control of Interior Permanent Magnet Synchronous Machines

Scheduled Presenters

Prof. T.M. Jahns, University of Wisconsin-Madison
Prof. N. Bianchi, University of Padua, Italy
Prof. Silverio Bolognani, University of Padua, Italy
Prof. Alfio Consoli, University of Catania, Italy
Prof. Alfredo Vagati, Politecnico Torino, Italy
Dr. Edward Lovelace, SatCon Technology Corp., USA
Prof. Shigeo Morimoto, Osaka Prefecture Univ., Japan (tentative)
Prof. Robert Lorenz, Univ. of Wisconsin-Madison

Tutorial Abstract

Interior permanent magnet (IPM) synchronous machines are emerging in new commercial, industrial, and transportation applications as one of the most promising means of achieving superior values of efficiency and power density in modern variable-speed drive applications. IPM machine drives are beginning to appear in a variety of important new applications including the powertrain of the Toyota Prius hybrid vehicle where two IPM machines are configured in a high-efficiency motor-generator combination. At least one major manufacturer (Yaskawa Electric) is now offering IPM machines with ratings as high as 200 kW.

Interior PM synchronous machines offer some significant advantages compared to conventional surface PM synchronous machines because of the hybrid nature of their torque production (magnet and reluctance). These advantages include their ability to achieve wide speed ranges of constant power operation, and their natural compatibility with position sensor elimination techniques.

Despite these advantages, IPM machines have been rather slow to gain wide acceptance in marketplace compared to surface PM machines. One of the major contributing factors is the fact that IPM machines are noticeably more difficult to design than surface magnet machines and the resulting torque characteristics are nonlinear. In particular, the impact of magnetic saturation plays a major role in determining the characteristics of IPM machines and must be properly accounted for in the design process. Design rules and tools for developing high-performance IPM machines are far less well developed and limited in their availability compared to those for surface PM machines.

The purpose of this proposed full-day tutorial is to assemble several international experts in the field of IPM synchronous machine technology to present a state-of-the-art review addressing key issues in the areas of design, analysis, and control of IPM machines. This tutorial is designed to appeal to Annual Meeting attendees with professional interests in the areas of electric machines and adjustable-speed drives from both academia and from industry. This tutorial will focus on practical design and control issues that need to be understood in order to successfully develop new IPM machine drive systems.

Major tutorial topics include the following:

1. IPM machine model; IPM machine analysis techniques; typical IPM performance characteristics
2. Alternative IPM machine configurations, describing key features and tradeoffs; IPM machine performance limit envelopes and IPM machine selection.
3. IPM machine electromagnetic, mechanical, and thermal design issues, including optimization.
4. IPM vector control and flux weakening techniques.
5. IPM drive position sensor elimination techniques.

This tutorial provides a unique opportunity to bring together several of the world's most renowned IPM machine experts to present a focused tutorial on this topic in way that has never been done before.

Servo Drives

Scheduled Presenters
Mario Pacas, University of Siegen
Ralph Kennel, Wuppertal University

Tutorial Abstract
The substantial developments in power electronics, motor technology and microelectronics in the last years has brought enormous momentum in the area of servo drives. In the past the servo technique was dominated by the DC-servos and the BLDC-Motors. Presently most servo applications in production machines and processes demand intelligent modular drives with new actuators and sophisticated control strategies.

Departing from the different industrial applications the main electrical and mechanical requirements and design criteria for servo drives will be explained. Further the different technical solutions and their components will be discussed: power electronics, sensors, actuators, control strategies and communication. One main topic of the tutorial is a survey on the sensors for angular position as key components on servos.

For each subsystem the special requirements of servos and the corresponding technologies will be explained considering the state of the art and the ongoing developments. Motion control, multi-axis systems and communication between the numerical control and the intelligent servos will be considered as well. Communications systems with their special futures in servos will be presented as necessary interfaces for this kind of drive. A system comparison shows the capabilities and drawbacks of each system in different practical applications.

The tutorial is intended as a complete survey on the topic and is addressed to engineers involved in the practical design of servo drives in the application of servo drives for new high demanding machines and processes.

Electric Drives and Their Control: From Understanding Basics to Designing for Advanced Control and Encoder-less Operation

Scheduled Presenter
Ned Mohan, University of Minnesota

Tutorial Abstract
The objective of this tutorial is two-fold: 1) in the first-half, we will begin with basics and analyze induction and permanent-magnet ac machines in a way that clearly explains how these machines operate on a physical basis, and hence how they ought to be controlled for optimum performance. And, 2) in the second-half of this tutorial we will examine the basis of vector control and encoder-less operation of ac machines in order to design speed and position controllers for such machines. Design of such controller will be demonstrated using MATLAB/Simulink.

Increasingly, electric machines are being used as a part of electric drives for controlling speed and position of the associated mechanical systems in applications such as robotics and in flexible production, transportation, harnessing of wind energy, and so on. As electric machines and drives become commodity items, the role of engineers in industry today and in the future will be as consultants, designers and system integrators in manufacturing processes. Therefore, the decades-old circuitoriented approach that is suited only for uncontrolled line-fed ac machines, and that unfortunately continues to be taught by most universities, is no longer appropriate.

The first-half of this tutorial will present a unique step-by-step physical understanding of induction and permanent-magnet ac machines that will clearly explain how these machines operate, and hence how they ought to be controlled for optimum performance. This approach is based on the space-vector theory that is traditionally reserved for advanced graduate-level courses. However, as this tutorial will explain, by introducing space vectors on a physical basis, they can be utilized from the very beginning, thus providing a seamless continuity to the discussion of advanced topics [1].

The above approach is based on two textbooks [2, 3] that have been adopted as textbooks at 23 small and large U.S. universities, and at several well-known universities in Europe and Asia in a span of just two years. These textbooks are backed-up two CDs with nearly 450 PowerPoint-based slides, each with an audio-clip recorded by the author that highlights the material being presented.

These CDs are ideal for preparing lectures in a very short time and for self-study. Attendees in this tutorial will get these two CDs as a part of the lecture notes.

[1] NSF/ONR-Sponsored Faculty Workshop on Teaching of Power Electronics and Electric Drives, www.ece.umn.edu/groups/PowerElectronics_Drives, Las Vegas, Feb 20-21, 2004.
[2] N. Mohan, "Electric Drives: An Integrative Approach", Minneapolis, MN: MNPERE, 2001. Website: www.mnpere.com.
[3] N. Mohan, "Advance Electric Drives: Analysis, Design and Modeling using Simulink", Minneapolis, MN: MNPERE, 2001. Website: www.mnpere.com.

Understanding Failure Modes, Protection and Reliability of Industrial Power Converters

Scheduled Presenters
Leon M. Tolbert, The University of Tennessee
Chris Melhorn, EPRI-PEAC
Doug Dorr, EPRI-PEAC
Bill Brumsickle, Soft-Switching Technologies

Tutorial Abstract
A successful product in today's industrial market must not only deliver on its electrical input/output specifications and manufacturing cost targets but also meet expectations of product reliability and safety. Understanding failure modes—and methods of protecting against ancillary damage when they occur—in semiconductor devices, capacitors, transformers, inductors, connectors, laminated bus structures, fans, etc., is a critical skill for industrial converter designers. This tutorial will include discussion of failure modes and protection methods, taught by experienced engineers. The instructors will also discuss basic reliability calculations and how they are applicable in the real world.

AC and DC Drive/Motor Selection in Industrial Applications

Scheduled Presenters
Brian Boulter, ApICS LLC
Robert Lockhart, ApICS LLC

Tutorial Abstract
This tutorial will provide the attendee with an analytical toolset that will enable him/her to identify the best motor/drive combination for a given industrial application. Topics to be covered include:

1) A description of typical industrial drive/motor applications.
2) Guidelines for deciding when to use an AC drive, and when to use a DC drive.
3) Specifying AC/DC drives for torque, speed, tension and positioning applications.
4) Specifying AC/DC drives for pressure, flow, mixing & other process applications.
5) Communication Protocols & Specifications, including a discussion on the effects of feedback & communication transport delays, and sampling, effects on loop stability and performance.
6) Guidelines for making trade-offs between footprint size, maintenance, and initial cost considerations.
7) Drives in motion control applications, and the special needs of these applications..
8) Conclusions and questions/answer period.

A CD with the PowerPoint presentation, and pertinent technical papers and worksheets will be supplied, along with hard copies of all worksheets, and equation data sheets.

Forensic Electrical Engineering: Engineering, Medical and Legal Aspects

Scheduled Presenters
Robert E. Nabours, Consultant
Paul F. Hill, Attorney-Law School Librarian-Retired

Tutorial Abstract
A forensic electrical engineering presentation to cover the functions of an EE, as an investigator and expert witness will be presented. An explanation of the relationship between attorneys and engineers, legal terminology, voluntary and obligatory standards, electrical codes and regulations will be given. The effects of electrical energy on humans, electrical products and failures, electrical fires, illumination and lightning will be discussed. Case studies illustrating the forensic electrical engineering process will be given. Legal principles involved with electricity, product liability and strict liability as viewed by various legal jurisdictions will be covered. Electric utility liability for PQ will be illustrated with case studies.

Guest Events

A Day at the Museum of Glass

October 4, 2004, 9:30 a.m. – 2:00 p.m. - $56.00

The Museum of Glass will be an experiential learning environment, allowing visitors of all ages to explore a wide variety of subjects through visual, performing, literary and technological arts. You will discover the joy of an environment that nurtures an appreciation for artistic expression. Opened in July 2002 and designed by internationally renowned architect Arthur Erickson, the distinctive profile of the Museum of Glass is immediately identifiable cultural landmark for the Pacific Northwest region. The 75,000 square-foot building encompasses galleries and exhibition spaces, an education studio, a "Hot Shop" amphitheater, museum store and café. Museum visitors will enjoy the surrounding area of the museum as well as the facility. One can stroll along the waterfront esplanade and marina, or ascend the steps and ramps to the rooftop plaza to take in the panoramic views of the city skyline of Tacoma, the Foss Waterway, and Mount Rainier. Your visit will include a docent led tour through this fascinating facility filled with the delicate and fragile beauty of hand blown glass. This tour will include a stroll across the Chihuly Bridge of Glass. This bridge will take pedestrians through a tunnel of brilliant light and color created by internationally renowned glass artist Dale Chihuly's glass forms. Spanning 500 ft, this one of a kind bridge will link the Tacoma waterfront with the downtown core. Following the tour through the galleries, a glassblowing demonstration in the Hot Shop Amphitheater will treat you to a choreographed visual display on the art of making glass. The interactive tour will continue as your docent explains the physics and chemistry integral to the process of glassmaking, introducing you to both the artistic and technical processes involved. This hot shop is housed in an imposing 90-foot-tall stainless steel cone, and includes a hot and cold glass studio.

Sample Seattle Deluxe City Tour

October 5, 2004, 9:00 a.m. – 12:00 p.m. - $25.00

Come sample Seattle. This tour provides an overview of the many attractions Seattle offers its visitors. We'll drive along the waterfront with its import shops and fresh seafood restaurants, into historic Pioneer Square. This area, one of Seattle's oldest, features early 1900's architecture, much of which has been renovated into wonderful art galleries and specialty shops. Next is our International District, the third largest on the West Coast. Evidence of the Pacific Rim cultural influence abounds here, even the streetlights have an Asian style. We will continue along Lake Washington to the University of Washington Campus. Continuing on, our first stop will be the Hiram Chittenden Locks and Salmon Ladder. The locks are an engineering feat, which connect saltwater Puget Sound with freshwater Lake Union. The salmon ladder features the seasonal migration of salmon returning to their parent streams to spawn. Next, travel to Magnolia Bluff where the view of Puget Sound is breathtaking. This precedes your last stop, the world famous Pike Place Farmers Market. Vendors from all around our region come to the market to showcase their wares. You'll have the opportunity to browse and hopefully find a perfect souvenir from your trip to the Emerald City.

Seattle Art Museum with Lunch at Cutter's

October 6, 2004, 10:00 a.m. – 3:00 p.m. - $66.00

The Seattle Art Museum, known to Seattlelites as SAM, has become a downtown landmark since it opened in 1992. The building, designed by the internationally recognized architect Robert Venturi, a work of art itself, provides the perfect backdrop for the museum's 20,000-piece collection. The breathtaking entrance includes a grand marble staircase rising from the lobby and featuring impressive Ming Dynasty tomb sculptures of marble. The second level is reserved for special exhibits and an amazing collection of Northwest coast Native American art and artifacts. African and Asian artwork are located on the third floor and the fourth level features European and American art, Northwest Modern art and photography. Lunch for your group will be at Cutter's Bayhouse Restaurant. Located near Pike Place Market, Cutter's commands a spectacular view of Puget Sound and the Olympic Mountains, complimenting perfectly with their Northwest style of fresh seafood and hospitality.

Technical Tours

Snoqualmie Falls Hydro Power Plant Tour

October 4, 2004, 9 a.m.- 1:00 p.m. - $22.00

Enjoy a behind the scenes look of one of Washington State's most popular scenic attraction. The Snoqualmie Falls Hydroelectric project consists of one dam and two powerhouses. The Project utilizes a concrete and wooden dam that extends across the river approximately 150 feet upstream from the 268-foot high Snoqualmie Falls. Plant 1, located in an underground cavity 270 feet beneath the Falls, was constructed in 1898. Plant 1 was the world's first electric generating facility to be built totally underground and the first major hydroelectric plant in Washington. Plant 2, located approximately one-quarter mile downstream from the Falls, was constructed in 1910 and expanded in 1957. The project has a combined generation capacity of 44,000 kw. You will also have time to visit Snoqualmie Falls National Park. More than 1.5 million visitors come to the Falls every year. At the Falls, you will find a two-acre park, observation deck, gift shop, the beautiful and elegant Salish Lodge and the famous 270 foot waterfall.
Notes: *Two groups (of 12) will tour at 10-11 am, one group (of 12) will tour at 11 am-12 pm. The maximum number for this tour is 36, so make your reservation early!*

Boeing Transonic Wind Tunnel Tour

October 5, 2004 1:30 p.m. – 4:00 p.m. - $20.00

The Boeing Transonic Wind Tunnel (BTWT) is a single-return closed-circuit tunnel with an 8-foot by 12-foot test section. The tunnel incorporates a heat exchanger and a dehumidification system for controlling test section temperature and humidity. The test section has a continuous-flow operating range up to Mach 1.1 and Reynolds number capability up to 4 million per foot. Airflow in the BTWT is provided by a 24-foot diameter, two-stage axial flow fan driven by a 55,000 HP 6 kV synchronous motor operating at up to 480 RPM. Motor speed is controlled by a dual-channel, water-cooled LCI drive.

Boeing Surplus Store

October 6, 2004, 10:00 a.m. – 1:00 p.m. - $33.00

The Boeing Surplus Store is a great open secret here in Puget Sound. It is a clearing house of sorts for all sorts of technical, office and testing supplies. Your group will have a guided tour through this large wonderland of gadgets, tools, furniture and equipment. Some of the items are listed below: Office furniture: desks, chairs, file cabinets, computer furniture, and many peripheral items such as white boards, carpet, storage cabinets, and safes are generally available in the store. Computer equipment of all makes and models, including monitors, printers, and laptops. Test equipment, frequently they have various pieces of electronic and mechanical test equipment: chart recorders, oscilloscopes, microscopes etc. Milling cutters, drills, reamers, dial indicators, air tools, and many other machine shop items are available in their world famous tool crib. For more information, see their web site at www.boeing.com/assocproducts/surplus.

Packing and shipping services have been arranged for the Boeing Surplus Store Tour October 6, 2004. Shippers will be responsible for all shipping charges. Tracking numbers for international packages will be provided on site. Tracking numbers for domestic packages will be available on request by phone later that afternoon.

Technical Program Schedule

Monday Technical Sessions

Session #1: Induction Motors - 1	Cascade II	8:00 am - 12:00 pm
Session #2: Salient Pole Machines	Vashon II	8:00 am - 12:00 pm
Session #3: Active Power Filters	Cascade IA	8:00 am - 12:00 pm
Session #4: Inverters	Cascade IB	8:00 am - 12:00 pm
Session #5: Primary Metal & Caster	Vashon I	8:00 am - 12:00 pm
Session #6: Current Sensing Technologies (Products and Services)	Grand Crescent	8:00 am - 12:00 pm
Session #7: Plasma Reactors	Cascade IC	8:00 am - 12:00 pm
Session #8: Permanent Magnet Motor Drives	St. Helens	8:00 am - 12:00 pm
Session #9: Fluorescent Ballasts	5th Avenue	8:00 am - 12:00 pm
Session #10: Special Machines	Cascade II	1:00 pm - 5:00 pm
Session #11: Switched Reluctance Machines	Vashon II	1:00 pm - 5:00 pm
Session #12: Industrial Power Converter (Products and Services)	Cascade IA	1:00 pm - 5:00 pm
Session #13: Rectifiers	Cascade IB	1:00 pm - 5:00 pm
Session #14: Power Quality, Robot Control, & Discharge Machining	Vashon I	1:00 pm - 5:00 pm
Session #15: Magnetic Components	Grand Crescent	1:00 pm - 5:00 pm
Session #16: Plasma Chemical Processes	Cascade IC	1:00 pm - 5:00 pm
Session #17: Induction Motor Drives	St. Helens	1:00 pm - 5:00 pm
Session #18: HID Ballasts	5th Avenue	1:00 pm - 5:00 pm

Tuesday Technical Sessions

Session #19: Diagnostics	Cascade II	8:00 am - 12:00 pm
Session #20: Power Systems Reliability	Vashon	8:00 am - 12:00 pm
Session #21: Multilevel Converters	Cascade IA&B	8:00 am - 12:00 pm
Session # 22: Design, Control, and Analysis in Power Converters	Cascade IC	8:00 am - 12:00 pm
Session# 23: Hot and Cold Rolling	Grand Crescent	8:00 am - 12:00 pm
Session #24: Status of High Temp. Devices and Components Products and Services	Grand II	8:00 am - 12:00 pm
Session #25: Electrostatic Spraying and Biological Applications	Olympic	8:00 am - 12:00 pm
Session #26: Sensorless Permanent Magnet Motor Drives	St. Helens	8:00 am - 12:00 pm
Session #27: Industrial Applications of Light	5th Avenue	8:00 am - 12:00 pm
Session #28: Permanent Magnet Machines - 1	Cascade II	2:00 pm - 5:30 pm
Session #29: Safety and Productivity in the Mining Industry	Vashon	2:00 pm - 5:30 pm
Session #30: DC/DC Converters	Cascade IA&B	2:00 pm - 5:30 pm
Session # 31: Alternative Engergy Applications	Cascade IC	2:00 pm - 5:30 pm
Session# 32: Sensors, Measurements, Communication and Fault Detection	Grand Crescent	2:00 pm - 5:30 pm
Session #33: SiC Device and High Performance Applications	Grand II	2:00 pm - 5:30 pm
Session #34: Charging and Discharging	Olympic	2:00 pm - 5:30 pm
Session #35: Sensorless Induction Motor Drives	St. Helens	2:00 pm - 5:30 pm
Session #36: Lighting Systems	5th Avenue	2:00 pm - 5:30 pm

Wednesday Technical Sessions

Session #37: Permanent Magnet Machines - 2	Cascade II	8:00 am - 12:00 pm
Session#38: Motor/Generator Related Technologies (Products and Services)	Vashon	8:00 am - 12:00 pm
Session #39: Power Electronics Building Block Concepts (Panel Session)	Cascade IA&B	8:00 am - 12:00 pm
Session #40: Utility Interface and Power Quality I	Cascade IC	8:00 am - 12:00 pm
Session #41: Industrial Controls and Mechatronics	Whidbey	8:00 am - 12:00 pm
Session #42: Power Modules	Grand I	8:00 am - 12:00 pm
Session #43: Corona Discharging	Olympic	8:00 am - 12:00 pm
Session #44: Swiched Reluctance Motor Drives	St. Helens	8:00 am - 12:00 pm
Session #45: LED and Other Lamps	5th Avenue	8:00 am - 12:00 pm
Session #46: Permanent Magnet Machines - 3	Cascade II	1:00 pm - 5:00 pm
Session #47: Power Systems Design	Vashon	1:00 pm - 5:00 pm
Session #48: Soft Switching and Resonant Converters	Cascade IA&B	1:00 pm - 5:00 pm
Session #49: Converter Applications and Implementation Issues	Cascade IC	1:00 pm - 5:00 pm
Session #50: Motion Controls	Whidbey	1:00 pm - 5:00 pm
Session #51: Device Integration Strategies	Grand I	1:00 pm - 5:00 pm
Session #52: Electrostatic Separation and Deposition	Olympic	1:00 pm - 5:00 pm
Session #53: Drives Interface Issue	St. Helens	1:00 pm - 5:00 pm
Session #54: Energy Systems I	5th Avenue	1:00 pm - 5:00 pm

Thursday Technical Sessions

Session #55: Linear Actuators	Cascade II	8:00 am - 12:00 pm
Session #56: Power Systems Analysis	Vashon	8:00 am - 12:00 pm
Session #57: PWM and Control Techniques	Cascade IA	8:00 am - 12:00 pm
Session #58: Utility Interface and Power Quality II	Cascade IC	8:00 am - 12:00 pm
Session #59: Electro-Thermal Issues	Whidbey	8:00 am - 12:00 pm
Session #60: Thermal Management	Cascade IB	8:00 am - 12:00 pm
Session #61: Computational Electrostatics and Electrohydrodynamics	Olympic	8:00 am - 12:00 pm
Session #62: Brushless and Synchronous Reluctance Motor Drives	St. Helens	8:00 am - 12:00 pm
Session #63: Power Systems Protection 1	5th Avenue	8:00 am - 12:00 pm
Session #64: Induction Motors - 2	Cascade II	1:00 pm - 5:00 pm
Session #65: Semiconductor Models and Capacitors	Cascade IA	1:00 pm - 5:00 pm
Session #66: Power Systems Engineering and Protection	Cascade IC	1:00 pm - 5:00 pm
Session #67: Intelligent Controls and Applications	Whidbey	1:00 pm - 5:00 pm
Session #68: Filtering and EMI	Cascade IB	1:00 pm - 5:00 pm
Session #69: Electrostatic Measurement and Controls	Olympic	1:00 pm - 5:00 pm
Session #70: Drives Applications	St. Helens	1:00 pm - 5:00 pm
Session #71: Energy System II	5th Avenue	1:00 pm - 5:00 pm

Technical Program Sessions

Monday Morning Sessions

SESSION 1

Cascade II • 8:00 am – 12:00 pm

Electric Machines
Induction Motors 1

Session Chair: Aldo Boglietti, *Politecnico di Torino*
Session Organizer: Aldo Boglietti, *Politecnico di Torino*

01p1 Determination of the Magnetic Losses in Induction Motors Based on the Generalized Epstein Test
André G. Tôrres, Braz J. Cardoso Filho, and Renato O. C. Lyra, *Universidade Federal de Minas Gerais*
Marco A. Cunha and Sebastião C. Paolinelli, *ACESITA S.A.*

01p2 An Investigation into the Electromagnetic Behavior of the Vector Controlled Induction Motor Drives
J. Joddar, W. Zhu, B. Fahimi, and S. Pekarek, *University of Missouri–Rolla*

01p3 Soft Started Induction Motor Modeling and Heating Issues for Different Starting Profiles Using a Flux Linkage ABC-Frame of Reference
Mark G. Solveson, *Eaton Corporation*
Behrooz Mirafzal and Nabeel A. O. Demerdash, *Marquette University*

01p4 Estimating the Parameters of an Induction Motor in Open-Loop and Closed-Loop Operation
A. J. Netto, P. R. Barros, C. B. Jacobina, and A. M. N. Lima, *UFCG*

01p5 Starting and Vector Control of Series-Connected Wound-Rotor Induction Motor in Super Synchronous Mode
E. M. Rashad, T. S. Radwan, and M. A. Rahman, *Memorial University of Newfoundland*

SESSION 2

Vashon II • 8:00 am – 12:00 pm

Electric Machines
Salient Pole Machines

Session Chair: Alan Wallace, *Oregon State University*
Session Organizer: Franco Leonardi, *Ford*

02p1 Iron Losses in Salient Permanent Magnet Machines at Field-weakening Operation
F. Magnussen, *Royal Institute of Technology* and *ABB*
Y. K. Chin, J. Soulard, S. Eriksson, and C. Sadarangani, *Royal Institute of Technology*
A. Broddefalk, *Surahammars Bruks AB*

02p2 Uncontrolled Generation in Interior Permanent Magnet Machines
C. Z. Liaw, W. L. Soong, and N. Ertugrul, *University of Adelaide*
B. A. Welchko, *General Motors*

02p3 Synchronous Frame Current Control of Multi-Phase Synchronous Motor—Part I: Modeling and Current Control Based on Multiple d-q Spaces Concept Under Balanced Condition
Hyung-Min Ryu, Ji-Woong Kim, and Seung-Ki Sul, *Seoul National University*

02p4 A Cross Saturation Model for Interior Permanent Magnet Synchronous Machine: Application to a Starter Generator
L. Chédot, *Valeo Electrical System*
G. Friedrich, *University of Technology of Compiègne*

02p5 Right Harmonic Spectrum for the Back-Electromotive Force of an n-Phase Synchronous Motor
Eric Semail, Xavier Kestelyn, and Alain Bouscayrol, *Ensam*

02p6 Design to Improve Starting Performance of Line-Start Synchronous Reluctance Motor for Household Appliances
H. Nam, S. B. Park, G. H. Kang, and J. P. Hong, *Changwon National University*
J. B. Eom and T. U. Jung, *LG Electronics Inc.*

02p7 Determination of Effective Air-Gap Length of Reluctance Synchronous Motors from Experimental Data
Prabhakar Neti and Subhasis Nandi, *University of Victoria*

SESSION 3

Cascade IA • 8:00 am – 12:00 pm

Industrial Power Converter
Active Power Filters

Session Chair: Burak Ozpineci, *Oak Ridge National Laboratory*
Session Organizer: Hiro Akagi, *Tokyo Institute of Technology*

03p1 Distributed Active Filter Systems (DAFS): A New Approach to Power System Harmonics
Po-Tai Cheng and Zhung-Lin Lee, *National Tsing Hua University*

03p2 An Adaptive Algorithm for Controlling Reactive Power Compensation in Active Power Filters
Huu-Phuc To, Faz Rahman, and Colin Grantham, *University of New South Wales*

03p3 Robust Deadbeat Current Control with Adaptive Predictor for Three-Phase Voltage-Source Active Power Filter
Katsumi Nishida, Tarek Ahmed, and Mutuo Nakaoka, *Yamaguchi University*

03p4 Time Delay and Dead-Time Compensation for a Current Controlled Four-Leg Voltage Source Inverter Utilized as a Shunt Active Filter
Marthinus G. F. Gous and Hendrik. J. Beukes, *University of Stellenbosch*

03p5 A Current-Fed HF Link Direct DC/AC Converter with Active Harmonic Filter for Fuel Cell Power Systems
Yu Jin Song and Prasad N. Enjeti, *Texas A&M University*
Se-Kyo Chung, *Gyeongsang National University*

03p6 A Novel Control Method for Shunt Active Power Filters Using SVPWM
Jianze Wang, Fenghua Peng, Qitao Wu, and Yanchao Ji, *Harbin Institute of Technology*
Yaping Du, *Hong Kong Polytechnic University*

03p7 An Active In-Line Notch Filter for Reducing Acoustic Noise in Drives
J. A. Ferreira, *Delft University of Technology*
P. Dorland, *South African Breweries*
F. G. de Beer, *Netherlands Organization for Applied Scientific Research (TNO)*

SESSION 4

Cascade IB • 8:00 am – 12:00 pm

Industrial Power Converter
Inverters

Session Chair: Bill Peterson, *E&M Power*
Session Organizer: Frede Blaabjerg, *Aalborg University*

04p1 Maximum Constant Boost Control of the Z-Source Inverter
Miaosen Shen, Jin Wang, Alan Joseph, and Fang Z. Peng, *Michigan State University*
Leon M. Tolbert, *University of Tennessee*
Donald J. Adams, *Oak Ridge National Laboratory*

04p2 Pulse-Width Modulation of Z-Source Inverters
Poh Chiang Loh, D. Mahinda Vilathgamuwa, Yue Sen Lai, Geok Tin Chua, and Yunwei Li *Nanyang Technological University*

04p3 Parallel Operation of Voltage Source Inverters with Minimal Intermodule Reactors
Bin Shi and Giri Venkataramanan, *University of Wisconsin–Madison*

04p4 Design of Plug-In Repetitive Controllers for Single-Phase PWM Inverters
Leandro Michels, Humberto Pinheiro, and Hilton A. Gründling, *Federal University of Santa Maria*

04p5 Zero Vector Modulation Method for Voltage Source Inverter Operating near Zero Output Frequency
Silva Hiti, David Tang, Constantin Stancu, and Eric Ostrom, *General Motors*

04p6 Odd-Harmonic Repetitive Controlled CVCF PWM Inverter with Phase Lead Compensation
Keliang Zhou, Kay-Soon Low, Soon-Hie Tan, Danwei Wang, and Yong-Qiang Ye
Nanyang Technological University

SESSION 5

Vashon I • 8:00 am – 12:00 pm

Metals
Primary Metal & Caster

Session Chair: Louis Drienhoefer, *Alcoa Inc.*
Session Organizer: S. Douglas Cromey, *Alcan Inc.*

05p1 Mathematical Model Based Coking Control System
S. Mitra, S. Majumdar, M. Gangadaran, U. Bhaskar, B. Chakraborty, B. K. Santra, and N. Neogi, *Steel Authority of India Ltd.*
S. S. Bandopadhyay, formerly with *Steel Authority of India Ltd.*

05p2 Design and Analysis of a Linear Type Electromagnetic Stirrer
S. Milind and V. Ramanarayanan, *Indian Institute of Science*

05p3 Measurement of Temperature Profiles in the Electrodes of Arc Furnaces for Silicon Metal Production
José Fariña and Juan J. Rodríguez-Andina, *University of Vigo*
Javier Bullón and Ángel Lorenzo, *Polígono Industrial de Sabón*

05p4 Optimization of the Level Sensor Position for a Continuous Slab Caster
Raul Miranda, Miguel Barron, Antonio de Ita, Luis Hoyos, and Jesus Gonzalez *Universidad Autonoma Metropolitana-Azcapotzalco*

05p5 Optimal and Efficient Solutions in the Presence of Time-Correlated Disturbances for Trajectory Tracking Control of Dynamic Multistage ROT Cooling Process
Nicholas S. Samaras and Nicholas T. Batis, *Larissa Institute of Technology*

SESSION 6 PRODUCTS AND SERVICES

Grand Crescent • 8:00 am – 12:00 pm

Power Electronic Devices
Current Sensing Technologies

Session Chair: Adam Konopka, *Baldor Electric*
Session Organizer: Rich Lukaszewski, *Rockwell*

ePhysics – Efficient Multiple Physical Domain Solutions for Electrical Engineers
Bogdan C. Ionescu

High-Side Shunt Current Measurement with EconoPACK™ Shunt Modules and a new developed Analog-Digital-Converter
Andreas Volke

Hall Effect Current Transducers: A Future Driven by Tailored ASIC Technologies
Eric Favre

Kohshin Digital Output Current Sensors
David Seals

Magneto-Resistive Closed Loop Current Sensor
Jim D Williams

IGBT Module including Shunt Resistors for Vector Control
Yasuyuki Kobayashi, Shuji Miyashita,Tadashi Miyasaka

Open Loop Current Sensing Using Hall Effect Technology
Richard Dickinson

SESSION 7

Cascade IC • 8:00 am – 12:00 pm

Electrostatic Processes
Plasma Reactors

Session Chair: Reece Roth, *University of Tennessee at Knoxville*
Session Organizer: Tetsuji Oda, *University of Tokyo*

07p1 Prospective Industrial Applications of the One Atmosphere Uniform Glow Discharge Plasma
J. Reece Roth, *University of Tennessee*

07p2 NO_3—Reduction for Flue Gas Cleaning using Wet-type Plasma Reactor
Youhei Kinoshita, Hiromitsu Ikeda, Kazunori Takashima, Shinji Katsura, Akira Mizuno, *Toyohashi University of Technology*

07p3 Study on the Improvement of Energy Efficiency in the Treatment of Dilute Trichloroethylene with Dielectric Barrier Discharge
SangBo Han and Tetsuji Oda, *The University of Tokyo*

07p4 A New Type of Corona Discharge Reactor for Simultaneous Removal of NO and SO_2 from Flue Gas
Li-Min Dong, Xiao-Chun Chi, and Jia-Yang Yang, *Harbin University of Science and Technology*
Wei Lu, *Heilongjiang Province Environmental Monitor Center*

07p5 Degradation of Indigo Carmine Using Bipolar Pulsed Dielectric Barrier Discharge (DBD) in the Water–Air Mixture
Ruo-bing Zhang, Guo-feng Li, and Yan Wu, *Dalian University of Technology*

07p6 Observation of Ground-State OH by LIF Technique in DC Nozzle-to-Plate Positive Streamer Coronas
Marek Kocik and Jerzy Mizeraczyk, *Institute of Fluid Flow Machinery*
Seiji Kanazawa, Atsushi Kajiwara, Jun-ichi Kumagai, Toshikazu Ohkubo, and Yukiharu Nomoto, *Oita University*
Jen-Shih Chang, *McMaster University*

07p7 Influence of Electrode Configuration on Energy Utilization for SO_2 Removal in Flue Gas with Pulsed Corona Plasma
Bingyan Dong, *Dalian University of Technology* and *Jiangxi University of Technology*
Guofeng, Li, Yan Wu, and Jie Li, *Dalian University of Technology*

SESSION 8

St. Helens • 8:00 am – 12:00 pm

Industrial Drives
Permanent Magnet Motor Drives

Session Chairs: Thomas Jahns, *University of Wisconsin–Madison,* and Nitin Patel, *Advanced Tech. Vehicles*
Session Organizer: Brian Welchko, *General Motors Advanced Technology Center*

08p1 Optimum Torque Control of Permanent Magnet AC Machines in the Field-Weakened Region
Gabriel Gallegos-Lopez, Fani S. Gunawan, and James E. Walters, *Delphi Corporation*

08p2 Magnet Flux Nulling Control of Interior PM Machine Drives for Improved Response to Short-Circuit Faults
Brian A. Welchko, *General Motors Advanced Technology Center*
Jackson Wai, Thomas M. Jahns, and Thomas A. Lipo, *University of Wisconsin–Madison*

08p3 Synchronous Frame Current Control of Multi-Phase Synchronous Motor—Part II: Asymmetric Fault Condition due to Open Phases
Hyung-Min Ryu, Ji-Woong Kim, and Seung-Ki Sul, *Seoul National University*

08p4 Investigation of Inverterless Control of Interior Permanent Magnet Alternators
C. Z. Liaw, D. M. Whaley, W. L. Soong, and N. Ertugrul, *University of Adelaide*

08p5 Current Polarity Detection-based Simple Position Sensorless Drive of IPMSM for AC Compressor in HEV
T. Kosaka, *University of Leicester*
M. Fujitsuna, *DENSO Corporation*
T. Takahashi and N. Matsui, *Nagoya Institute of Technology*

08p6 Feedforward Control of High-Speed Solid-Rotor Synchronous Reluctance Machines with Rotor Dynamics Model
Jae-Do Park and Heath Hofmann, *The Pennsylvania State University*
Claude Khalizadeh, *Pentadyne Power Corporation*

08p7 P.M. Assisted Synchronous Reluctance Drive for Minimal Hybrid Application
P. Guglielmi, G. Giraudo, G. M. Pellegrino, and A. Vagati, *Politecnico di Torino*

SESSION 9

5th Avenue • 8:00 am – 12:00 pm

Production & Application of Light
Fluorescent Ballasts

Session Chair: Jim Lester, *Sylvania*
Session Organizer: Bill Peterson, *E&M Power*

09p1 A Low-Size Multi-Power-Level Single-Transistor Ballast for Low Pressure Fluorescent Lamps, Using a Piezoelectric Transformer
Matthias Radecker, Fábio E. Bisogno, and Alois Knoll, *Fraunhofer-Institut für Autonome intelligente Systeme*
Alfredo V. Carazo, *Face Electronics LC*
Gunther Löhmann, *Osram GmbH*
Gerald Deboy, *Infineon Technologies AG*

09p2 Improvement in Control Stability for High-Efficiency Electronic Ballast
Yuuji Takahashi and Keiichi Shimizu, *Toshiba Lighting & Technology Corporation*

09p3 Adaptive Preheat and Strike of Microcontroller Based Ballas
Qinghong Yu, Christopher Radzinski, and Jay Dernovsek, *Universal Lighting Technologies*

09p4 Self-Oscillating Electronic Ballast Evaluation Through Non-Linear Dynamic Systems Analysis
Alysson R. Seidel and Ricardo N. Do Prado, *UFSM*
Luís F. Pereira, *PUCRS*

09p5 A Full-Digital Dimming Ballast with a Digital Power Controller (DPC) for a Fluorescent Lamp
In-Hwan Oh, Madhu Rayabhari, and Maurizio A. Zecchini, *Fairchild Semiconductor*

09p6 Low Voltage DC supplied Dimmable Ballast for 1 x 36 W T8 Lamp
Peter Green, *International Rectifier*

Monday Afternoon Sessions

SESSION 10

Cascade II • 1:00 pm – 5:00 pm

Electric Machines
Special Machines

Session Chair: Jerry Lloyd, *Emerson Electric*
Session Organizer: Patrick Chapman, *University of Illinois*

10p1 A Millimeter-Scale Electric Generator
Matthew K. Senesky and Seth R. Sanders, *University of California, Berkeley*

10p2 Micro-Stepping Control of Ultrasonic Stepping Motors
K. T. Chau and Bin Shi, *The University of Hong Kong*
Min-Qiang Hu, Long Jing, and Ying Fan, *Southeast University*

10p3 A Short Cylinder Ultrasonic Motor With Novel Excitation Mode
K. T. Chau and Bin Shi, *The University of Hong Kong*
Long Jing, Min-Qiang Hu, and Ying Fan, *Southeast University*

10p4 A Novel Three-Phase Doubly Salient Permanent Magnet Machine for Wind Power Generation
K. T. Chau and Ying Fan, *The University of Hong Kong*
Ming Cheng, *Southeast University*

10p5 Study with Magnetic Property Measurement of Soft Magnetic Composite Material and Its Application in Electrical Machines
Jian Guo Zhu and YouGuang Guo, *University of Technology, Sydney*

10p6 Theoretical and Experimental Research on Hybrid-Magnetic-Circuit Multi-Couple Motor
Ping Zheng, Yong Liu, Tiecheng Wang, and Shukang Cheng, *Harbin Institute of Technology*

10p7 Comparison and Review of Electric Machines for Integrated Starter Alternator Applications
William Cai, *Delco Remy America, Inc.*

SESSION 11

Vashon II • 1:00 pm – 5:00 pm

Electric Machines
Switched Reluctance Machines

Session Chair: Keith Bradley, *University of Nottingham*
Session Organizer: Ronghai Qu, *GE*

11p1 Prediction of Electromagnetic Forces and Vibrations in SRMs Operating at Steady State and Transient Speeds
Zhangjun Tang, *Stryker Instruments*
Pragasen Pillay and Yicheng Chen, *Clarkson University*
Avoki M. Omekanda, *Delphi Research Labs*

11p2 Design and Optimization of High Torque, Low Ripple Switched Reluctance Motor with Flux Barrier for Direct Drive401
J. Hur, *Korea Electronic Technology Inst.*
G. H. Kang, J. Y. Lee, and J. P. Hong, *Changwon National University*
B. K. Lee, *Korea Electric Research Inst.*

11p3 Simplified Control of Switched Reluctance Machines for AC Generation
R. G. Lopez and B. Diong, *The University of Texas at El Paso*

11p4 GA-based Computer Aided Autonomous Electromagnetic Design of Switched Reluctance Servomotor Drives
T. Kosaka and C. Pollock, *University of Leicester*
T. Shikayama, *Yaskawa Electric Corporation*
T. Nakagami, Y. Kano, and N. Matsui, *Nagoya Institute of Technology*

11p5 Instantaneous Shaft Radial Force Control with Sinusoidal Excitations for Switched Reluctance Motors
Feng-Chieh Lin and Sheng-Ming Yang, *Tamkang University*

11p6 Design and Performance Analysis of a Switched Reluctance Motor for Low Duty Cycle Operation
M. Faizul Momen and Iqbal Husain, *The University of Akron*

SESSION 12 PRODUCTS AND SERVICES

Cascade IA • 1:00 pm – 5:00 pm

Industrial Power Converter
Products and Services

Session Chair: Leon Tolbert, *University of Tennessee, Knoxville*
Session Organizer: Leon Tolbert, *University of Tennessee, Knoxville*

Powering Future Vehicles: General Motors Next Generation Propulsion Drive Systems
Nitin Patel, Khwaja Rahman, Terence Ward and James Nagashima
General Motors- Advanced Technology Center
Fast Charging and Power Management of High Voltage Electric Vehicles Using a Multi Channel DC-DC Converter
Subrata Mondal and David Francis
AeroVironment Inc.,
A Novel Power Converter Design Allows Integration of High Power and High Speed Circuits
Jeff Reichard and Joanne Achhammer
Tier Electronics
Resonant Power Supplies for Architectural Glass Coating
Eric Seymour and Annabelle Pratt
Advanced Energy Industries
High Performance Inverters for Alternative Energy Sources
Subrata Mondal, Troy Nergaard, and Zaher Daboussi
AeroVironment Inc.,
Portable Power Disturbance Generator to Diagnose and Resolve Power Quality Related Issues with AC and DC Variable Frequency Drives
Doug Dorr
EPRI-PEAC
On-Line Diagnosis of VFD-Driven Motors and Loads
Ernesto Wiedenbrug
Baker Instruments

SESSION 13

Cascade IB • 1:00 pm – 5:00 pm

Industrial Power Converter
Rectifiers

Session Chair: Alex Julian, *Naval Postgraduate School*
Session Organizer: Jose Rodriguez, *Universidad Federico Santa Maria*

13p1 Novel Three-Phase High-Quality Multi-Resonant Rectifiers Operating with Zero-Current-Switching and Constant Switching Frequency
Jagjitpati Shukla and B. G. Fernandes, *Indian Institute of Technology*

13p2 An Auxiliary-Supply-Assisted Twelve-Pulse Diode Rectifier with Reduced Input Current Harmonics
Fukuda Shoji and Ohta Masaaki, *Hokkaido University*

13p3 Comparative Analysis of Multiple-Loops Linear and Non-Linear Control Schemes Applied to a Three-Phase Three-Switch Three-Level Rectifier
H. Y. Kanaan, *Saint-Joseph University*
K. Al-Haddad, *École de Technologie Supérieure*
F. Fnaiech, *University of Tunis*

13p4 Design of DC Link Current Observer for a Three-Phase Active Rectifier with Feedforward Control
Zhongfu Zhou and P. J. Unsworth, *University of Sussex*
Yanzhen Liu, *American Superconductor*

13p5 Current Distribution in Paralleled Thyristors: A Comparative Analysis of Five Real Cases in High Current Transformer—Rectifiers
Ricardo Fuentes, *Universidad Técnica Federico Santa María*

13p6 Single-Switch Step-Up/Down Three-Phase Rectifier with Sinusoidal Input Current
Congwei Liu and Sanmin Wei, *Ryerson University*
Jianyun Chai and Xudong Sun, *Tsinghua University*

SESSION 14

Vashon I • 1:00 pm – 5:00 pm

Metals
Power Quality, Robot Control, & Discharge Machining

Session Chair: S. Douglas Cromey, *Alcan Inc.*
Session Organizer: S. Douglas Cromey, *Alcan Inc.*

14p1 Equipment Failures Caused by Power Quality Disturbances
Ashish Bendre, *DRS Power and Control Technologies*
Deepak Divan, William Kranz, and William Brumsickle, *SoftSwitching Technologies*

14p2 Using Measurements and Analytical Studies to Minimize Power Quality Issues Impacting Tin Mill Operations
Thomas J. Dionise and Visuth Lorch, *Eaton Electrical*

14p3 Two-Folded Implementation of a Twelve-Pulse TCR with Dissimiliar Transformers for a Ladle Furnace: Reactive Power Compensation and Power System Redundancy
N. Köse, A. Terciyanli, B. Gültekin, F. Bilgin, and C. Ermis, *TUBITAK Bilten*
B. Mutluer and M. Ermis, *TUBITAK Bilten* and *Middle East Technical University*
S. Hasbay, M. Keyifli, and T. Ahi, *ISDEMIR Iron & Steel Works Inc.*

14p4 Electrical Discharge Machining for Sharpening Diamond Disks
Jesus Doval-Gandoy, *University of Vigo*
Ramón Pasandin and Bernardo Fernandez, *HEGASA*

14p5 Paralleled LCsCp Resonant Converters for Spark Erosion Applications6
Rosario Casanueva, Francisco J. Azcondo, Christian Brañas, and Salvador Bracho, *University of Cantabria*

SESSION 15

Grand Crescent • 1:00 pm – 5:00 pm

Power Electronic Devices
Magnetic Components

Session Chair: Jean-Pierre Keradec, *Laboratoire d'Electrotechnique de Grenoble*, and Charlie Sullivan, *Dartmouth University*
Session Organizer: Jean-Luc Schanen, *Laboratoire d'Electrotechnique de Grenoble*

15p1 Design of Equivalent Circuits and Characterization Strategy for n-Input Coupled Inductors
X. Margueron and J-P. Keradec, *Laboratoire d'Electrotechnique de Grenoble*

15p2 Design of a New Air-Cored Current Transformer: Analytical Modeling and Experimental Validation
D. Porto, J. L. Bermudez, and F. Rachidi, *Swiss Federal Institute of Technology*
E. Favre and B. Richard, *LEM Group*

15p3 PEEC-like Analytical Calculation of Static Leakage Inductances of H.F. Transformers
D. Magot, X. Margueron, and J-P. Keradec, *Laboratoire d'Electrotechnique de Grenoble*

15p4 Modeling of Soft Magnetic Composites
Yanhong Cui and G. B. Kliman, *Rensselaer Polytechnic Institute*

15p5 Gapped-Inductor Foil Windings with Low AC and DC Resistance
Jennifer D. Pollock and Charles R. Sullivan, *Dartmouth College*

SESSION 16

Cascade IC • 1:00 pm – 5:00 pm

Electrostatic Processes
Plasma Chemical Processes

Session Chair: Toshiaki Yamamoto, *Osaka Prefecture University*
Session Organizer: Seiji Kanazawa, *Oita University*

16p1 Plasma Surface Modification of Gold and Palladium Catalysts for CO Oxidation
R. Sharma, R. D. Rimmer, B. J. Davis, R. Shekhawat, J. Gunamgari, M. K. Mazumder, and D. A. Lindquist *University of Arkansas at Little Rock*

16p2 Plasma-Driven Catalyst Process for the Decomposition of VOCs
Hyun-Ha Kim, Seung-Min Oh, Atsushi Ogata, and Shigeru Futamura, *National Institute of Advanced Industrial Science and Technology*

16p3 NOx Reduction Using Nitrogen Nonthermal Plasma Desorption
Masaaki Okubo, Masaki Inoue, Tomoyuki Kuroki, and Toshiaki Yamamoto, *Osaka Prefecture University*

16p4 Charge Behavior Observation on/in Plasma Processed Thin Films by LIPP during Thermal Heating for TSDC Analysis
Tetsuji Oda and Kouji Yamashita, *The University of Tokyo*

16p5 Plasma Reforming of Aliphatic Hydrocarbons with CO_2
Shigeru Futamura and Annadurai Gurusamy, *National Institute of Advanced Industrial Science and Technology*

16p6 Water Vapor Desorption and Adsorbent Regeneration Using Nonthermal Plasma
Toshiaki Yamamoto, Goichi Tanioka, Masaaki Okubo, and Tomoyuki Kuroki, *Osaka Prefecture University*

16p7 Experimental and Numerical Investigations for CF_4 Decomposition Using RF Low Pressure Plasma
Tomoyuki Kuroki, Shingo Tanaka, Masaaki Okubo, and Toshiaki Yamamoto, *Osaka Prefecture University*

SESSION 17

St. Helens • 1:00 pm – 5:00 pm

Industrial Drives
Induction Motor Drives

Session Chairs: Robert Bertz, *University of New Castle*, and Mahesh Swamy, *Yaskawa Electric*
Session Organizer: Mustafa Guven, *Caterpillar Inc.*

17p1 Adjustable Speed Drives with Square-Wave Input Current: A Cost Effective Step in Development to Improve their Performance
Christian Klumpner, *University of Nottingham*
Adrian Timbus and Frede Blaabjerg, *Aalborg University*
Paul Thøgersen, *Danfoss Drives A/S*

17p2 Extended High Speed Operation via Electronic Winding Change Method for AC Motors
Mahesh M. Swamy and Tsuneo J. Kume, *Yaskawa Electric America*
Akihiko Maemura and Shinya Morimoto, *Yaskawa Electric Corporation*

17p3 Direct Torque Control Schemes for Split-Phase Induction Machine
Kamalesh Hatua, *Honeywell Technology Solutions Lab Pvt. Ltd.*
V. T. Ranganathan, *Indian Institute of Science*

17p4 Compensation Control of Matrix Converter Fed Induction Motor Drive under Abnormal Input Voltage Conditions
Kai Sun, Daning Zhou, and Lipei Huang, *Tsinghua University*
Kouki Matsuse, *Meiji University*

17p5 High Performance Speed Sensorless Control of an Induction Motor Drive Using a Minimalist Single-Phase PWM Converter
Olorunfemi Ojo, Zhiqiao Wu, and Gan Dong, *Tennessee Technological University*

17p6 A Novel Six-Phase Series-connected Two-Motor Drive with Decoupled Dynamic Control
Martin Jones, Slobodan N. Vukosavic, Emil Levi, and Atif Iqbal, *Liverpool John Moores University*

17p7 Reduction of Parameter Sensitivity in an Induction Motor Current Regulator using Integrated Pilot Sensors in the Low-Side Switches
Sibaprasad Chakrabarti, Thomas M. Jahns, and Robert D. Lorenz, *University of Wisconsin–Madison*

SESSION 18

5th Avenue • 1:00 pm – 5:00 pm

Production & Application of Light
HID Ballasts

Session Chair: Jo Olsen, *Osram Sylvania*
Session Organizer: Bill Peterson, *E&M Power*

18p1 New HF Square-Waveform Ballast for Low Wattage Metal Halide Lamps Free of Acoustic Resonances
J. Garcia, J. Cardesín, M. Alonso, J. Ribas, and A. Calleja, *University of Oviedo*

18p2 Acoustic Resonance Band Detection Workbench for HID Lamps
J. C. Antón, C. Blanco, F. Ferrero, J. Viera, N. Bordel, and A. Martín, *University of Oviedo*
G. Zissis, *Université Paul Sabatier*

18p3 A Novel Low Frequency Electronic Ballast for HID Lamps
Hua Li and Miaosen Shen, *Zhejiang University*
Zhaoming Qian, *Michigan State University*

18p4 Analysis and Design of a New Hot-Striking Igniter for HID Lamp
Yifeng Jiang, Qiukai Huang, Min Chen, and Zhaoming Qian, *Zhejiang University*

18p5 Supply Voltage Fluctuation Characteristics of Leakage Transformer Type Operating Circuit with Bypass Circuit for a Metal Halide Lamp
Hidenobu Miyake, *Kyudenko Co. Ltd.*
Michio Iemura, *Sojo University*

18p6 Power Fed Electronic Ballast
Francisco J. Azcondo, Christian Brañas, Rosario Casanueva, and Salvador Bracho, *University of Cantabria*

18p7 Stacked Buck Converter for HID Lamps
D. H. J. van Casteren and M. A. M. Hendrix, *Technical University of Eindhoven*

Tuesday Morning Sessions

SESSION 19

Cascade II • 8:00 am – 12:00 pm

Electric Machines
Diagnostics

Session Chair: Gerard Capolino, *University of Picardie*
Session Organizer: Jason Stack, *Navy*

19p1 Effects of Load on Diagnosing Broken Bar Faults in Induction Motors Using the Pendulous Oscillation of the Rotor Magnetic Field Orientation
Behrooz Mirafzal and Nabeel. A. O. Demerdash, *Marquette University*

19p2 Diagnosis and Numerical Simulation of Large Hydra-Generator under Steady-State after Heating Faults of Insulation Aging
Zhou Feng, Li Weili, and Cheng Shukang, *Harbin Institute of Technology*
Dong Huanzhong, *The Third Product Works*

19p3 Sensitive and Reliable Detection of Broken Rotor Bar Fault in Induction Motors
Boqiang Xu, Heming Li, and Liling Sun, *North China Electric Power University*

19p4 Calculation of Circulating Bearing Currents in Machines of Inverter-based Drive Systems
A. Muetze and A. Binder, *Darmstadt University of Technology*

19p5 Online Stator Resistance Estimation for Thermal Monitoring of Converter Fed Induction Motors Using Pseudo Random Modified PWM
Lance C. Benn and Bruce Burton, *University of KwaZulu-Natal*
Ron G. Harley, *Georgia Institute of Technology*

19p6 Diagnostics of Induction Machines Using the Zero Sequence Voltage
Pablo García, Fernando Briz, and Alberto B. Diez, *University of Oviedo*
Michael W. Degner, *Ford Motor Company*

19p7 Monitoring of Induction Machines by Maximum Covariance Method for Frequency Tracking
Alberto Bellini, Giovanni Franceschini, and Carla Tassoni, *University of Parma*

SESSION 20

Vashon • 8:00 am – 12:00 pm

Power System Engineering
Power Systems Analysis

Session Chair: Wei-Jen Lee, *University of Texas at Arlington*
Session Organizer: Wei-Jen Lee, *University of Texas at Arlington*

20p1 Response of Power Cables to Fast Transient Loads
Robert E. Henry, *Bechtel National Inc.*

20p2 Electrical Power System in Buildings with Higher Risk for Seismic Event
Giuseppe Parise and Luigi Martirano, *University of Rome "La Sapienza"*

20p3 The First 110 KV/35 KV–31.5 MVA Cast Resin Transformer
David C. M. Yuen, *affiliation not indicated*
Vincent Choi, *Edison Electrical Group*
Liu Zhi Gao and Jun Han, *JMC Electrical Group*

20p4 Identification of Power Frequency Industrial Magnetic Field Sources for Shielding Purposes
A. Canova, F. Freschi, M. Repetto, and M. Tartaglia, *Politecnico di Torino*

20p5 Load Modelling for Steady-State and Transient Analysis of Low-Voltage dc Systems
Daniel Nilsson and Ambra Sannino, *Chalmers University of Technology*

SESSION 21

Cascade I A&B • 8:00 am – 12:00 pm

Industrial Power Converter
Multilevel Converters

Session Chair: Grahame Holmes, *Monash University*
Session Organizer: Geza Joos, *McGill University*

21p1 Design and Comparison of Medium Voltage Multi-Level Converters for Industry Applications
Dietmar Krug, Mariusz Malinowski, and Steffen Bernet, *Berlin University of Technology*

21p2 Multiple Input Converters for Fuel Cells
Burak Ozpineci, *Oak Ridge National Laboratory*
Leon M. Tolbert, *Oak Ridge National Laboratory* and *The University of Tennessee*
Zhong Du, *The University of Tennessee*

21p3 Comparative Evaluation of Modulation Algorithms for Neutral Point Clamped Converters
Ashish Bendre, Slobodan Krstic, and James Vander Meer, *DRS Power and Control Technologies*
Giri Venkataramanan, *University of Wisconsin–Madison*

21p4 Multilevel DC Link Inverter
Gui-Jia Su, *Oak Ridge National Laboratory*

21p5 Extended Operation of Flying Capacitor Multilevel Inverters
Jing Huang and Keith Corzine, *University of Missouri–Rolla*

21p6 A Novel Hybrid Diode-Clamp Cascade Multilevel Converter for High Power Application
Kai Ding, Yun-ping Zou, Zhan Wang, Zhi-chao Wu, and Yun Zhang, *Huazhong University of Science & Technology*

21p7 New Configurations for the Three-Phase Asymmetrical Multilevel Inverter
S. Mariethoz and A. Rufer, *EPFL*

SESSION 22

Cascade IC • 8:00 am – 12:00 pm

Industrial Power Converter

Design, Control and Analysis in Power Converters

Session Chair: Jim Galloway, *J. H. Galloway & Associates*
Session Organizer: Philip Kjær, *Vestas Wind Systems A/S*

22p1 A Novel Detection Method of Active and Reactive Currents in Single-Phase Circuits Using the Correlation and Cross-Correlation Coefficients and Its Applications
Toshihiko Tanaka, Kengo Ueda, and Kuniaki Satou, *Shimane University*
Shinji Fukuma, *Fukui University*

22p2 Dynamic Improvement in UPS by Means of Control Delay Minimization
P. Mattavelli, *University of Udine*
F. Polo, S. Sattin, and F. Dal Lago, *Socomec Sicon*

22p3 Analysis of Loss and Junction Temperature in Power Semiconductors of the Matrix Converter Using Simple Simulation Methods
Akihiro Odaka, Jun-ichi Itoh, Ikuya Sato, Hideki Ohguchi, Hirokazu Kodachi, Naoya Eguchi, and Hidetoshi Umida, *Fuji Electric Advanced Technology Co., Ltd.*

22p4 Synchronous Frame PI Current Regulators in a Virtually Translated System
Hyunbae Kim, *Samsung Electronics*
Robert D. Lorenz, *University of Wisconsin–Madison*

22p5 On-Line and Off-Line Control Design in Power Electronics and Drives Using Genetic Algorithms
Pericle Zanchetta and Mark Sumner, *University of Nottingham*
Francesco Cupertino, Maria Marinelli, and Ernesto Mininno, *Politecnico di Bari*

22p6 Reactor Vibration Analysis in Consideration of Coupling between the Magnetic Field and Vibration
Tetsuhiro Ishikawa and Hiroo Sugiyama, *Toyota Motor Co, Ltd.*
Emiko Baba, *Toyota Techno Service Co, Ltd.*
Ryusuke Oka, *Toyota Communication System Co, Ltd.*

22p7 Development of Calculation Toolbox for Harmonic Estimation on Multi-pulse Drives
Lucian Asiminoaei and Steffan Hansen, *Aalborg University*
Frede Blaabjerg, *Danfoss Drives A/S*

SESSION 23

Grand Crescent • 8:00 am – 12:00 pm

Metals

Hot and Cold Rolling

Session Chair: Juergen Schwahn, *Alcan Inc.*
Session Organizer: S. Douglas Cromey, *Alcan Inc.*

23p1 Transient Wrinkling Analysis of Steel Web Rolling
Dong-Teak Chung, *Korea University of Technology & Education*
Kee-Hyun Shin, *Konkuk University*

23p2 An Improvement of the Thermal Model for Producing the Ultra-Thin Strips in a Conventional Hot Strip Mill
Yuan-Liang Hsu, *China Steel Corporation*
Chang-Huei Wu, *Yuan-Ze University*

23p3 Camber Measurement System in a Hot Rolling Mill
C. Fraga, R. C. Gonzalez, J. A. Cancelas, and J. M. Enguita, *University of Oviedo*
L. A. Rodriguez Loredo, *Aceralia Steel Company*

23p4 Pointwise Linear Quadratic Optimal Control of a Tandem Cold Rolling Mill
John Pittner and Marwan A. Simaan, *University of Pittsburgh*

23p5 Applications of Digital Image Processing Technique for Steel Mill Non-Contacting Conveyance System Operations
Cheng-Tsung Liu and Yung-Yi Yang, *National Sun Yat-Sen University*
Sheng-Yang Lin, *China Steel Corporation*

23p6 Thickness Quality Control and Diagnosis System For Tinplate Rolling Mills
Jose M. Enguita, Cesar Fraga, Abel A. Cuadrado, and Yolanda Fernandez, *University of Oviedo*
Jose L. Rendueles and Guillermo Vecino, *Aceralia Corporacion Siderurgica*

SESSION 24 PRODUCTS AND SERVICES

Grand II • 8:00 am – 12:00 pm

Power Electronic Devices

Status of High Temperature Devices and Components

Session Chair: Hsueh-Rong Chang, *Rockwell*
Session Organizer: Rich Lukaszewski, *Rockwell*

SiC Devices – State of the Art and Future Development
Leo Lorenz
Present Status and Future Prospects of SiC Power Devices
John Donlon
A 1MHz Hard-Switched SiC DC/DC Converter
Abou-Alfotouh
Investigation into Operating Characteristics of Hybrid Si - SiC 25A 1200V Power Modules
Gary Skibinski
High SOA Turn-Off Devices for New Generations of Power Conversion Equipment
Eric Carroll
SiC Motor Drive (Tentative Title)
Hsueh-Rong Chang
Power Semiconductor Device Trends for Automotive Applications
K.Rajashekara

SESSION 25

Olympic • 8:00 am – 12:00 pm

Electrostatic Processes

Electrostatic Spraying and Biological Applications

Session Chair: Akira Mizuno, *Toyohashi University of Technology*
Session Organizer: Hidekatsu Fujishima, *Oaska Prefecture University*

25p1 Electrostatic Application of Carpet Yarn Spin Finishes as a Strategy for Reducing Environmental Water Pollution: Theoretical Basis
S. Edward Law, *University of Georgia*

25p2 Enhancement of Blood Compatibility of Implants by Helium Plasma Treatment
S. De, R. Sharma, N. Ali, and M. K. Mazumder, *University of Arkansas at Little Rock*

25p3 Sterilization Characteristics by a Coaxial Microwave Plasma Flow at Atmospheric Pressure
Takehiko Sato, *Tohoku University*
Kazunari Fujioka, Raju Ramasamy, Takuya Urayama, and Shuitsu Fujii, *Adtec Plasma Technology Co. Ltd.*

25p4 Deposition of Charged Inhaled Aerosols With Transient Airflow In Sequential Lung Airway Model
Diew Koolpiruck, Simant Prakoonwit, and Wamadeva Balachandran, *Brunel University*

25p5 Effect of Electrostatic Charge and Size Distributions on Respirable Aerosol Deposition in Lung Model
D. Saini, J. Gunamgari, C. Zulaloglu, R. A. Sims, and M. K. Mazumder, *University of Arkansas at Little Rock*

25p6 Use of Carbon Nanostructures for Hydrogen Storage for Environmentally Safe Automotive Applications
A. S. Biris, J. Darsey, and M. K. Mazumder, *University of Arkansas at Little Rock*
A. R. Biris and D. Lupu, *National Institute for Isotopic and Molecular Technologies*
D. Buzatu, *3National Center for Toxicology Research*

SESSION 26

St. Helens • 8:00 am – 12:00 pm

Industrial Drives
Sensorless Permanent Magnet Motor Drives

Session Chairs: Seung-Ki. Sul, *Seoul National University*, and Edward Lin, *Baldor Electric Co.*
Session Organizer: Fernando Briz, *University of Oviedo*

26p1 Robust Estimator Design for Signal Injection-based IPM Synchronous Machine Drives
Pierré Vadstrup, *Grundfos Management A/S*
Robert D. Lorenz, *University of Wisconsin–Madison*

26p2 Sensorless Control of PMSM Drives Using a Combination of Voltage Model and HF Signal Injection
Antti Piippo, Marko Hinkkanen, and Jorma Luomi, *Helsinki University of Technology*

26p3 Initial Position Estimation and Low Speed Sensorless Control of Synchronous Motors in Consideration of Magnetic Saturation Based on System Identification Theory
Shinji Ichikawa, Shinji Doki, and Shigeru Okuma, *Nagoya University*
Mutuwo Tomita, *Gifu National College of Technology*

26p4 Carrier Signal Injection based Sensorless Control Methods for IPM Synchronous Machine Drives
Hyunbae Kim, *Samsung Electronics*
Robert D. Lorenz, *University of Wisconsin–Madison*

26p5 Circuit Configuration and Performance of a Position-Sensorless IPM Motor Drive System
Satoshi Ogasawara, *Utsunomiya University*
Hirofumi Akagi, *Tokyo Institute of Technology*

26p6 Sensorless Direct Torque Control of Five-Phase Interior Permanent Magnet Motor Drives
Leila Parsa and Hamid A. Toliyat, *Texas A&M University*

26p7 New "D-State-Observer" Based Sensorless Vector Control for Permanent Magnet Synchronous Motors
Shinji Shinnaka, *Kanagawa University*

SESSION 27

5th Avenue • 8:00 am – 12:00 pm

Production & Application of Light
Industrial Applications of Light

Session Chair: Georges Zissis, *CPAT*
Session Organizer: Francis Dawson, *University of Toronto*

27p1 Recent Progress of UV Lamps for Industries
Yukihiro Morimoto, Taku Sumitomo, Masaki Yoshioka, and Tetsu Takemura, *Ushio Inc.*

27p2 Monitoring of Ultraviolet Light Sources for Water Disinfection
Gordon Knight, *Trojan Technologies Inc.*

27p3 Development of a Powerful Vortex Stabilized Water-Wall Flash Lamp for RTP Applications
T. Thrum, D. Camm, S. Dets, A. Hewett, VI. Rudic, G. C. Stuart, and A. Viel, *Vortek Industries Ltd.*

Tuesday Afternoon Sessions

SESSION 28

Cascade II • 2:00 pm – 5:30 pm

Electric Machines
Permanent Magnet Machines 1

Session Chair: Thomas M. Jahns, *University of Wisconsin–Madison*
Session Organizer: Ed Lovelace, *Satcon Technologies*

28p1 Approach to Decrease Rotor Iron Losses of High Speed or Torque BLDC Motors
A. Cassat, *Seagate Technology Inc.* and *Ecole Polytechnique Fédérale de Lausanne*
C. Espanet, *University of Franche-Comté*

28p2 Performance Analysis of Fractional Slot Wound PM-Motors for Low Speed Applications
Pia Salminen, Markku Niemelä, and Juha Pyrhönen, *Lappeenranta University of Technology*
Juhani Mantere, *ABB Oy*

28p3 Optimal Flux Weakening in Surface PM Machines Using Concentrated Windings
Ayman M. EL-Refaie and Thomas M. Jahns, *University of Wisconsin–Madison*

28p4 Fault-Tolerant Five-Phase Permanent Magnet Motor Drives
Leila Parsa and Hamid A. Toliyat, *Texas A&M University*

28p5 Permanent Magnet Brushless Machines with Unequal Tooth Widths and Similar Slot and Pole Numbers
D. Ishak, Z. Q. Zhu, and D. Howe, *University of Sheffield*

28p6 Pole Optimization of Brushless DC Motor
Ping Zheng, Yong Liu, Tiecheng Wang, and Shukang Cheng, *Harbin Institute of Technology*

28p7 Design of Spoke Type BLDC Motors with High Power Density for Traction Applications
Byoung-Kuk Lee and Dong-Wook You, *Korea Electrotechnology Research Institute*
Gyu-Hong Kang, *Changwon National University*
Jin Hur, *Korea Electronics Technology Institute*

SESSION 29

Vashon • 2:00 pm – 5:30 pm

Mining
Safety and Productivity in the Mining Industry

Session Chair: Thomas Novak, *Virginia Polytechnic Institute and State University*
Session Organizer: Michael R. Yenchek, *National Institute for Occupational Safety and Health*

29p1 High-Power Regenerative Converter for Ore Transportation under Failure Conditions
J. Pontt, J. Rodríguez, R. Huerta, and P. Newman, *Technical University Federico Santa María*
Werner Michel, *University of Applied Sciences*
Christian Lastra, *Compañía Minera Los Pelambres*

29p2 Operation of High Power Cycloconverter-Fed Gearless Drives under Abnormal Conditions
J. Pontt and J. Rodríguez, and J. Rebolledo, *Universidad Federico Santa Maria Casilla*
K. Tischler and N. Becker, *Siemens AG*

29p3 Multilevel Current Source Inverter Topology Based on Dual Structure Associations
Sangshin Kwak, *affiliation not indicated*
Hamid A. Toliyat, *Texas A&M University*

29p4 Current Source Connection of Electrolytic Cell Electrodes: An Improvement for Electrowinning and Electrorefinery
Eduardo P. Wiechmann, Guillermo A. Vidal, and Antonio J. Pagliero, *University of Concepcion*

29p5 Resonances and Overvoltages in a Medium Voltage Fan Motor Drive with Long Cables in an Underground Mine
J. Rodríguez, J. Pontt, C. Silva, R. Musalem, P. Newman, and S. Fuentes, *T. University Federico Santa María*

29p6 Corona Discharge Initiated Mine Explosions
H. K. Sacks and Thomas Novak, *Virginia Polytechnic Institute and State University*

SESSION 30

Cascade I A&B • 2:00 pm – 5:30 pm

Industrial Power Converter
DC/DC Converters

Session Chair: Bob Guenther, *NWL*
Session Organizer: Bill Peterson, *E&M Power*

30p1 A New Approach to Reducing Output Ripple in Switched-Capacitor-based Step-Down DC–DC Converters
Jifeng Han, Annette von Jouanne, and Gabor C. Temes, *Oregon State University*

30p2 A Novel Combined Converter with Naturally Sharing Input-Current and High Voltage Gain Applied in Aeronautical Power Supplies
Jianjiang Shi, Lifeng Chen, and Xiangning He, *Zhejiang University*
Yangguang Yan, *Nanjing University of Aeronautics & Astronautics*

30p3 A Critical Evaluation and Design of Bi-Directional DC/DC Converters for Super-Capacitors Interfacing in Fuel Cell Applications
M. Cacciato, F. Caricchi, F. Giulii Capponi, and E. Santini, *University of Rome "La Sapienza"*

30p4 High Power DC–DC Converter and Fuel Cell Distributed Generation System
HaiPing Xu, XuHui Wen, and Li Kong, *Chinese Academy of Sciences*

30p5 Design and Analysis of a Current-Mode Controlled Battery/Ultracapacitor Hybrid
Shengyi Liu and Roger A. Dougal, *University of South Carolina*

30p6 Analysis and Control of a Buck DC–DC Converter Operating with Constant Power Load in Sea and Undersea Vehicles
Claudio Rivetta, Ali Emadi, and Geoffrey A. Williamson, *Illinois Institute of Technology*
Ranjit Jayabalan and Babak Fahimi, *University of Missouri–Rolla*

SESSION 31

Cascade IC • 2:00 pm – 5:30 pm

Industrial Power Converter
Alternative Energy Applications

Session Chair: Annette von Jouanne, *Oregon State University*
Session Organizer: Burak Ozpineci, *Oak Ridge National Laboratory*

31p1 Multiobjective MPPT/Charging Controller for Stand-alone PV Power Systems under Different Insolation and Load Conditions
Zhenhua Jiang and Roger A. Dougal, *University of South Carolina*

31p2 Design and Control of a Low Power DC–AC Converter Fed by a Photovoltaic Array
F. Belkacem, D. Diallo, and G. A. Capolino, *University of Picardie "Jules Verne"*

31p3 A Novel Fifteen Level Inverter for Photovoltaic Power Supply System
Abdul Rahiman Beig, Udaya Kumar R. Y., and V. T. Ranganathan, *National Institute of Technology*

31p4 A New Soft Switching Direct Converter for Residential Fuel Cell Power System
Han Ju Cha and Prasad N. Enjeti, *Texas A&M University*

31p5 A Modular PV Regulator Based on Microcontroller with Maximum Power Point Tracking
Jorge Arias, F. F Linera, J. Martín-Ramos, and Alberto M. Pernía, *University of Oviedo*
José Cambronero, *Torytrans S.L.*

31p6 An Advanced Power Converter Topology to Significantly Improve the CO Tolerance of the PEM Fuel Cell Power Systems
Woojin Choi, Prasad N. Enjeti, and Anthony J. Appleby, *Texas A&M University*

SESSION 32

Grand Crescent • 2:00 pm – 5:30 pm

Industrial Automation & Control
Sensors, Measurements,Communication & Fault Detection

Session Chair: T. Hamrita, *University of Georgia*
Session Organizer: R. Petrella, *University of L'Aquila*

32p1 An Embedded System for Position and Speed Measurement Adopting Incremental Encoders
Marco Faccio, Paolo Grande, Francesco Parasiliti, Roberto Petrella, and Marco Tursini, *University of L'Aquila*

32p2 Navigation of Mobile Sensors Using PSO and Embedded PSO in a Fuzzy Logic Controller
Ganesh K. Venayagamoorthy and Sheetal Doctor, *University of Missouri–Rolla*

32p3 Anodic Nano-Porous Humidity Sensing Thin Films for the Commercial and Industrial Applications
Michael J. Haji-Sheikh, Joe Ervin, and Michael Andersen, *Northern Illinois University*

32p4 Improved Operation of Networked Control Systems using Lebesgue Sampling
Roy McCann, Anil Kumar Gunda, and Suchit Reddy Damugatla, *University of Arkansas*

32p5 Sensorless Position Control of DC Actuators for Automotive Applications
A. Consoli and G. Bottiglieri, *University of Catania*
R. Letor and R. Ruggeri, *STMicroelectronics*
A. Testa and S. De Caro, *University of Messina*

32p6 Estimation of Stator Winding Faults in Induction Motors Using an Adaptive Observer Scheme
Carsten Skovmose Kallesøe andPierre Vadstrup, *Grundfos Management A/S*
Henrik Rasmussen and Roozbeh Izadi-Zamanabadi, *Aalborg University*

SESSION 33

Grand II • 2:00 pm – 5:30 pm

Power Electronic Devices
SiC Device and High Performance Applications

Session Chair: Leo Lorenz, *Imphineon*
Session Organizer: Jean-Luc Schanen, *Laboratoire d'Electrotechnique de Grenoble*

33p1 Evaluating Conduction Loss of a Parallel IGBT-MOSFET Combination
Jonathan W. Kimball and Patrick L. Chapman, *University of Illinois at Urbana–Champaign*

33p2 4H-SiC GTO Thyristor and p-n Diode Loss Models for HVDC Converter
Madhu Sudhan Chinthavali and Burak Ozpineci, *Oak Ridge National Laboratory*
Leon M. Tolbert, *The University of Tennessee*

33p3 Modeling and Characterization of a Merged PiN-Schottky Diode with Doping Compensation of the Drift Region
S. Musumeci, R. Pagano, and A. Raciti, *University of Catania*
F. Frisina, M. Melito, and M. Saggio, *STMicroelectronics*

33p4 Characterization of SiC PiN Diode Forward Bias Degradation
Allen Hefner, Ranbir Singh, Colleen Ellenwood, and Dave Berning, *National Institute of Standards and Technology*
Ty McNutt, *University of Arkansas*
Adwoa Akuffo, *Howard University*
Mrinal K. Das and Joseph J. Sumakeris, *Cree Inc.*
Robert Stahlbush, *Naval Research Laboratory*

33p5 High Temperature Design and Testing of a DC–DC Power Converter with Si and SiC Devices
Biswajit Ray, *Bloomsburg University*
Russell L. Spyker, *Air Force Research Laboratory*

33p6 1 MHz Power Factor Correction Boost Converter with SiC Schottky Diode
P.-O. Jeannin, D. Frey, J.-C. Podvin, J.-P. Ferrieux, J. Barbaroux, and J.-L. Schanen, *Laboratoire d'Electrotechnique de Grenoble*
B. Rivet, *STMicroelectronics*

33p7 Minimizing Magnetic Components Losses in a new DC–DC Converter for Portable Fuel Cell Applications
G. Lefevre, J. P. Ferrieux, and J. Barbaroux, *Laboratoire d'Electrotechnique de Grenoble*
P. Boggetto and P. Charlat, *Axane*

SESSION 34

Olympic • 2:00 pm – 5:30 pm

Electrostatic Processes

Charging and Discharging

Session Chair: Malay Mazumder, *University of Arkansas at Little Rock*
Session Organizer: Carlos Calle, *NASA Kennedy Space Center*

34p1 Measurement of Charge Distribution of Highly Charged Particles by E-SPART Analyzer
P. K. Srirama and M. K. Mazumder, *University of Arkansas at Little Rock*

34p2 Electrodynamic Removal of Contaminant Particles and Its Applications
A. S. Biris, D. Saini, P. K. Srirama, M. K. Mazumder, and R. A. Sims, *University of Arkansas at Little Rock*
C. I. Calle and C. R. Buhler, *Kennedy Space Center*

34p3 Analysis and Modeling of Electrostatic Discharge in a Tactile Glass Featured Watch
Paolo Germano, Mircea Crivii, Daniele Demarco, and Yves Perriard, *Swiss Federal Institute of Technology*
Lionel Paratte and Roger Marquis, *ETA SA Manufacture Horlogère Suisse*

34p4 An Overview of the Technical Policy Developed by Renault to Manage ESD Risks in Airbags
Jean Rivenc, Javier Vazquez-Garcia, Peniamin Matossian, Brahim el Banani, and André Agneray, *Renault SAS*

34p5 Discharge Current from Lift-up Device
Yutaka Soda, *Sony Corporation*

SESSION 35

St. Helens • 2:00 pm – 5:30 pm

Industrial Drives

Sensorless Induction Motor Drives

Session Chairs: G. Capolino, *Univ. of Picardie*, and Victor Stefanovic, *Consultant*
Session Organizer: Fernando Briz, *University of Oviedo*

35p1 Rotor Position Estimation of AC Machines Using the Zero Sequence Carrier Signal Voltage
Fernando Briz, Pablo García, and Juan M. Guerrero, *University of Oviedo*
Michael W. Degner, *Ford Motor Company*

35p2 Rotor Position Estimation for Induction Machines at Zero and Low Frequency Utilizing Zero Sequence Currents
C. Spiteri Staines, G. M. Asher, and M. Sumner, *The University of Nottingham*

35p3 Sensorless Acquisition of the Rotor Position Angle for Induction Motors with Arbitrary Stator Windings
Jorge Juliet, *Universidad Federíco Santa María*
Joachim Holtz, *University of Wuppertal*

35p4 An Adaptive Sliding Mode Observer for Induction Motor Sensorless Speed Control
Jingchuan Li and Longya Xu, *The Ohio State University*
Zheng Zhang, *Whirlpool Corporation*

35p5 A Novel Nonlinear and Intelligent Control Technique for Induction Motor Drive Systems
A. Kaletsanos, *Metallurgic Industry Halcor*
F. Xepapas and S. N. Manias, *National Technical University of Athens*

35p6 Direct Torque Control for Dual-Three Phase Induction Motor Drives
R. Bojoi, F. Farina, G. Griva, F. Profumo, and A. Tenconi, *Politecnico di Torino*

35p7 An Adaptive Speed Observer Based on a New Total Least-Squares Neuron for Induction Machine Drives
Maurizio Cirrincione and Marcello Pucci, *Institute on Intelligent Systems for the Automation*
Giansalvo Cirrincione and Gérard-André Capolino, *University of Picardie-Jules Verne*

Wednesday Morning Sessions

SESSION 36

5th Avenue • 2:00 pm – 5:30 pm

Production & Application of Light
Lighting Systems

Session Chair: Mark Fellows, *Philips*
Session Organizer: Bill Peterson, *E&M Power*

36p1 Electrode Erosion in Pulse Operated High-Pressure-Sodium Lamps
Walter Kaiser, Alexander Fernandez Correa, and Ricardo Paulino Marques
Escola Politécnica da Universidade de São Paulo

36p2 A Control Fieldbus Applied to Electronic Ballasts Management
Roberto P. Silveira, Gustavo W. Denardin, Tiago B. Marchesan, Alexandre Campos, and Ricardo N. do Prado, *Universidade Federal de Santa Maria*

36p3 Aspects of Energy Consumption in Large Lighting Systems
J. Václavík, M. Novák, and A. Richter, *Technical University of Liberec*
G. Zissis, *University of Toulouse*

36p4 Lamp Driver Concepts for Dielectric Barrier Discharge Lamps and Evaluation of a 110 W Ballast
Wolfram Sowa and Reinhard Lecheler, *OSRAM GmbH*

36p5 "NumeLiTe:" An Energy Efficient Lighting System for Roadways and a Commercial Application of a Dimming Power Supply
R. Ruscassié and C. Glaize, *Univ. Montpellier II*
J. B. Rouffet and G. Zissis, *University of Toulouse*
M. Huber, E. Maechler, and U. Rast, *Knobel AG Lichttechnische komponenten*

36p6 Evaluation of a High Efficiency Boost Stage to Supply a Permanent LED Emergency Lighting System
A. J. Calleja, M. Rico-Secades, J. Cardesín, J. Ribas, E. L. Corominas, J. M. Alonso, and J. García, *Universidad de Oviedo*

SESSION 37

Cascade II • 8:00 am – 12:00 pm

Electric Machines
Permanent Magnet Machines 2

Session Chair: Nicola Bianchi, *University of Padova*
Session Organizer: Nicola Bianchi, *University of Padova*

37p1 Analytical Design Method of Polyphase Claw-Pole Machines
J. Cros, J. R. Figueroa, and P. Viarouge, *Université Laval*

37p2 PM Wind Generator Comparison of Different Topologies
Yicheng Chen and Pragasen Pillay, *Clarkson University*
Azeem Khan, *University of Cape Town*

37p3 Axial-Flux PM Starter/Alternator Machine with a Novel Mechanical Device for Extended Flux Weakening Capabilities
L. Del Ferraro, F. Caricchi, F. Giulii Capponi, and G. De Donato, *University of Roma "La Sapienza"*

37p4 Application of Direct Drive Wheel Motor for Fuel Cell Electric and Hybrid Electric Vehicle Propulsion System
K. Rahman, N. Patel, T. Ward, and J. Nagashima, *General Motors*
F. Caricchi, *University of Rome "La Sapienza"*
F. Crescimbini, *University ROMA TRE*

37p5 Short-Circuit Current Reduction Technique for Surface Mounted PM Machines: High Torque-Low Speed Applications
Cédric Noël, Noureddine Takorabet, and Farid Meibody-Tabar, *Institut National Polytechnique de Lorraine*

37p6 Increasing Field Weakening Capability of an Axial Flux PM Machine
Juan A. Tapia, Delvis Gonzalez, Rogel R. Wallace, and M. Anibal Valenzuela, *University of Concepcion*

SESSION 38 PRODUCTS AND SERVICES

Vashon • 8:00 am – 12:00 pm

Electric Machines
Motor/Generator Related Technologies

Session Chair: Co Huynh, *Calnetix*
Session Organizer: Rob Cuzner, *DRS Power & Controls Technology*

Manufacturing Options for Motor and Generator Laminations: An Overview
Steve Sprague
Proto Laminations, Inc

New Materials and Surface Processing of Rare Earth Magnets at Shin-Yasuaki Aoyama, Koji Miyata, and Nobu Tabuchi
Etsu Chemical

Magnet Wires: An Overview
Deborah Eagleson
Phelps Dodge Magnet Wire Co

Methods and Equipment Commonly Used for Magnetic Testing and Characterization of Permanent Magnets and Magnetically Soft Materials
Todd McMullen
Magnetic Instrumentation, Inc.

Magnetic Simulation at Shin-Etsu Chemical: Magnetic Field Analysis
Yasuaki Aoyama, Koji Miyata, and Nobu Tabuchi
Shin-Etsu Chemical Co

New Materials Improve Performance of High Speed and High Temperature of Switched Reluctance Machines for Aerospace Applications
Madan Bansal
Honeywell Engine, System and Services

Most Common Things that Can Cause Your Electric Motor to Fail
Austin Bonnett
Electrical Apparatus Service Association

SESSION 39 PANEL SESSION

Cascade IA&B • 8:00 am – 12:00 pm

Industrial Power Converter
Power Electronics Building Block Concepts

Session Chair: Yuri Khersonsky, *Consultant*
Session Organizer: Yuri Khersonsky, *Consultant*

SESSION 40

Cascade IC • 8:00 am – 12:00 pm

Industrial Power Converter
Utility Interface and Power Quality 1

Session Chair: Bill Brumsickle, *Soft Switching Technology*
Session Organizer: Giri Venkataramanan, *University of Wisconsin–Madison*

40p1 A 21-Level (Line-to-Line) BTB System Based on Series Connection of Sixteen Converter-Cells for Power Flow Control: Experimental Verifications by a 200-V, 10-kW Laboratory System
Makoto Hagiwara, Hideaki Fujita, and Hirofumi Akagi, *Tokyo Institute of Technology*

40p2 Micro-Grid Power Quality Enhancement Using a Three-Phase Four-Wire Grid-Interfacing Compensator
Y. W. Li, D. M. Vilathgamuwa, and P. C. Loh, *Nanyang Technological University*

40p3 A Three-Phase Utility Power Supply Based on the Matrix Converter
Dimosthenis Katsis, *US Army Research Laboratory*
Patrick Wheeler, Jon Clare, and Pericle Zanchetta, *University of Nottingham*

40p4 Controller Design for Dynamic Voltage Restorer with Harmonics Compensation Function
Young-Hoon Cho, *Hyundai-mobis Co., Ltd.*
Seung-Ki Sul, *Seoul National University*

40p5 Control Technique for the Compensation of Current Harmonics with Tolerance to Line Voltage Dips
Alberto Pigazo, Ramón I. Diego, and Víctor M. Moreno, *University of Cantabria*

40p6 Reduce Beat and Harmonics in Grid-Connected Three-Level Voltage Source Converters with Low Switching Frequencies
F. Wang, *Virginia Polytechnic Institute and State University*

40p7 A Multi-Function Power Quality Utility for Connecting Co-generation Systems to the Power Mains
R. L. A. Ribeiro, Rio *Grande do Norte*
O. O. Barbosa, A. M. N. Lima, C. B. Jacobina, E. R. C. da Silva, and E. R. Braga Fl., *Universidade Federal da Paraíba*

SESSION 41

Whidbey • 8:00 am – 12:00 pm

Industrial Automation & Control

Industrial Controls & Mechatronics

Session Chair: M. N. Uddin, *Lakehead University*
Session Organizer: M. N. Uddin, *Lakehead University*

41p1 Impact of Correlation Errors on the Optimum Kalman Filter Gain Identification in a Single Sensor Environment
Rafael Cardoso, Helder Tavares Câmara, and Hilton Abílio Gründling, *Universidade Federal de Santa Maria*
Elder Moreira Hemerly, *Centro Técnico Aeroespacial*

41p2 H∞ Position Control with Robust Friction Compensation for a Two-Mass System
K. Peterand B. Orlik, *University of Bremen*

41p3 Optimal Control Switching of Thyristor Controlled Braking Resistor for Transient Stability Augmentation
Ahmed Rubaai and Donatus Cobbinah, *Howard University*

41p4 A Robust Two-Degree-of-Freedom Control Design Technique and Its Practical Application
Robert Miklosovic and Zhiqiang Gao, *Cleveland State University*

41p5 Text Independent Automatic Speaker Recognition Using Self-Organizing Maps
Alexandre Teixeira Mafra, *Escola Politécnica da USP*
Marcelo Godoy Simões, *Colorado School of Mines*

41p6 On Properties and Applications of a New Form of Discrete Time Optimal Control Law
Zhiqiang Gao, *Cleveland State University*
Shaohua Hu, *Harvard University*

SESSION 42

Grand I • 8:00 am – 12:00 pm

Power Electronic Devices

Power Modules

Session Chair: Robert Pasterczyk, *MGE UPS System*, and Patrick Chapman, *University of Illinois*
Session Organizer: Jean-Luc Schanen, *Laboratoire d'Electrotechnique de Grenoble*

42p1 Inside a Power Module
C. Martinand and J. L. Schanen, *Laboratoire d'Electrotechnique de Grenoble*
R. Pasterczyk, *MGE UPS System*

42p2 Power Electronics Modules for Inverter Applications using Flip-Chip on Flex-Circuit Technology
H. N. Shah, Y. Xiao, T. P. Chow, and R. J. Gutmann, *Rensselaer Polytechnic Institute*
E. R. Olson, S-H. Park, W-K. Lee, J. J. Connors, T. M. Jahns, and R. D. Lorenz, *University of Wisconsin–Madison*

42p3 4.5 kV Press Pack IGBT Designed for Ruggedness and Reliability
Simon Eicher, Munaf Rahimo, Evgeny Tsyplakov, Daniel Schneider, Arnost Kopta, Ulrich Schlapbach, and Eric Carroll, *ABB Switzerland Ltd.*

42p4 Application Characteristics of an Experimental RB-IGBT (Reverse Blocking IGBT) Module
E. R. Motto and J. F. Donlon, *Powerex Incorporated*
M. Tabata, H. Takahashi, Y. Yu, and G. Majumdar, *Mitsubishi Electric Power Semiconductor Device Works*

42p5 Design and Optimization of Embedded Power Chip Modules for Double-sided Cooling
Jian Yin, J. D. van Wyk, W. G. Odendaal, and Zhenxian Liang, *Virginia Polytechnic Institute and State University*

SESSION 43

Olympic • 8:00 am – 12:00 pm

Electrostatic Processes
Corona Discharging

Session Chair: K. Robinson, *Eastman Kodak*
Session Organizer: Ed Law, *University of Georgia*

43p1 Characterisation of Dual Corona Electrodes for Electrostatic Processes Applications
Abdelber Bendaoud, Amar Tilmatine, and Karim Medles, *University Djillali Liabes*
Mustapha Rahli, Mihai Huzau, and Lucian Dascalescu, *University Institute of Technology*

43p2 Corona and Spark Discharges Occurring between a Grounded Sphere and an Array of Charged Multiple Electrodes
Toshiyuki Sugimoto, Koichiro Chiba, and Yoshio Higashiyama, *Yamagata University*

43p3 DC Corona Discharge from a Wire Particle Floated with a Micro-Gap in Parallel Plate Electrodes
Yusuke Kudo, Toshiyuki Sugimoto, and Yoshio Higashiyama, *Yamagata University*

43p4 Influence of Particle Concentration on Corona Discharge in the CAROLA Collector of Oil Droplets
A. M. Bologa, FH-R. Paur, and H. Seifert, *Forschungszentrum Karlsruhe GmbH*
J. Handte, *Handte & Co. GmbH*

43p5 Computational and Experimental Study of Ionic Space Charge Generated by Combined Corona-Electrostatic Electrode Systems
Laurentiu Marius Dumitran and Petru V. Notingher, *University Politehnica*
Lucian Dascalescu, *University Institute of Technology*
Pierre Atten, *CNRS*

43p6 Investigation of Electrostatic Discharge (ESD) for a Three Body Problem with Small Gaps
William D. Greason, *The University of Western Ontario*

43p7 Current Waveform of Space Charge Discharge Occurred in a Charged Particle Cloud
Yoshio Higashiyama, Hiroyuki Kikuchi, and Toshiyuki Sugimoto, *Yamagata University*

SESSION 44

St. Helens • 8:00 am – 12:00 pm

Industrial Drives
Switched Reluctance Motor Drives

Session Chairs: Nobuyuki Matsui, *Nagoya Institute of Technology*, and Joe Xiang, *Visteon Corporation*
Session Organizer: Takashi Kosaka, *Nagoya Institute of Technology*

44p1 Design of an SRM-based Actuator for High-Performance Steering Vane Control on the Landing Craft Air Cushion (LCAC) Hovercraft
Jifeng Han, Xiaolin Zhou, Annette von Jouanne, and Alan Wallace, *Oregon State University*
Dallas Marckx and Greg Hjelmeland, *Chinook Power Technologies, LLC*
Jerry Lloyd and Pete Wung, *Emerson Motor Company*

44p2 High Performance Four-Quadrant Switched Reluctance Traction Drive Based on DITC
Nisai H. Fuengwarodsakul and Rik W. De Doncker, *Aachen University*
Marcus Menne and Robert B. Inderka, *DaimlerChrysler AG*

44p3 Theory and Operation of a Four Quadrant Switched Reluctance Motor Drive with a Single Controllable Switch– The Lowest Cost Four Quadrant Brushless Motor Drive
R. Krishnan, Sung-Yeul Park, and Keunsoo Ha, *Virginia Tech*

44p4 A Hybrid Sensorless SRM Drive with Eight- and Six-Switch Converter Topologies
A. Khalil and I. Husain, *The University of Akron*
S. A. Hossain, *Globe Motors*
S. Gopalakrishnan, A. Omekanda, and B. Lequesne, *Delphi Research Labs*
H. Klode, *Delphi E&C Systems*

44p5 SRM Power Converter for Operation with High Demagnetization Voltage
Amit Kumar Jain and Ned Mohan, *University of Minnesota*

44p6 Load Invariant Sensorless Control of an SRM Drive Using High Frequency Signal Injection
Ekrem Kayikci, Michael C. Harke, and Robert D. Lorenz, *University of Wisconsin–Madison*

44p7 A Study of Dead-Time of PWM Rectifier of Voltage-Source Inverter without DC Link Components and Its Operating Characteristics of Induction Motor
Kenichi Iimori, Katsuji Shinohara, and Kichiro Yamamoto, *Kagoshima University*

SESSION 45

5th Avenue • 8:00 am – 12:00 pm

Production & Application of Light
LED and Other Lamps

Session Chair: Ricardo Nederson do Prado, *Federal University of Santa Maria*
Session Organizer: Bill Peterson, *E&M Power*

45p1 Modeling the Electrical Behavior of Fluorescent Lamps on the Basis of a Self-Consistent Collisional-Radiative Model
K. H. Loo, D. A. Stone, R. C. Tozer, M. Jinno, and R. Devonshire, *University of Sheffield*

45p2 Driver for High Efficiency LED Based on Flyback Stage with Current Mode Control for Emergency Lighting System
M. Rico-Secades, A. J. Calleja, J. Cardesín, J. Ribas, E. L. Corominas, J. M. Alonso, and J. García, *Universidad de Oviedo*

45p3 Comparison of the Emission of a High Pressure Na Lamp Working at 50 Hz and at High Frequency
Antonio Martín, Nerea Bordel, Cecilio Blanco, and Juan C. Alvarez, *University of Oviedo*
Georges Zissis, *University Paul Sabatier*

45p4 Calculation of the Impedance of an Axisymetric DBD Lamp for Power Supply Design Purposes
S. Bhosle, G. Zissis, and J. J. Damelincourt, *Université Paul Sabatier*
F. P. Dawson, *University of Toronto*

45p5 An Effective LED Dimming Approach
Prathyusha Narra and Donald S. Zinger, *Northern Illinois University*

45p6 Parallel Connected LEDs Operated at High Frequency to Improve Current Sharing
Srinivasa M. Baddela, *Advanced Transformer*
Donald S. Zinger, *Northern Illinois University*

Wednesday Afternoon Sessions

SESSION 46

Cascade II • 1:00 pm – 5:00 pm

Electric Machines
Permanent Magnet Machines 3

Session Chair: Zach Fu, *Visteon*
Session Organizer: Zach Fu, *Visteon*

46p1 BEGA—A Biaxial Excitation Generator for Automobiles: Comprehensive Characterization and Test Results
Sever Scridon, *Beespeed Automatizari Ltd. Timi_´oara*
Ion Boldea and Lucian Tutelea, *University Politehnica of Timi_´oara*
Frede Blaabjerg and Ewen Ritchie, *Aalborg University*

46p2 Three-Dimensional Force Analyses of an Axial-flow Radial-flux Permanent Magnet Motor with Magnetic Suspension
Cheng-Tsung Liu and Tsung-Shiun Chiang, *National Sun Yat-Sen University*

46p3 A Study on Eddy-Current Losses in Rotors of Surface Permanent Magnet Synchronous Machines
Masatsugu Nakano and Haruyuki Kometani, *Mitsubishi Electric Corporation*
Mitsuhiro Kawamura, *Toshiba Mitsubishi-Electric Industrial Systems Corporation*

46p4 Effect of Axial Segmentation of Permanent Magnets on Rotor Loss of Modular Brushless Machines
J. D. Ede, K. Atallah, G. W. Jewell, J. B. Wang, and D. Howe, *The University of Sheffield*

46p5 Modelling of Permanent Magnet AC Machine by Taking into Account Dynamic and Static Inductances
C. Attaianese, V. Nardi, and G. Tomasso, *University of Cassino*

46p6 Assessment of Torque Components in Brushless Permanent Magnet Machines through Numerical Analysis of the Electromagnetic Field
D. M. Ionel and S. Dellinger, *A.O. Smith Corp.*
M. Popescu, M. McGilp, and T. J. E. Miller, *University of Glasgow*

46p7 Design Considerations of Sinusoidally Excited Permanent Magnet Machines for Low Torque Ripple Applications
Mohammad S. Islam, Sayeed Mir, Tomy Sebastian, and Samuel Underwood, *Delphi Steering*

SESSION 47

Vashon • 1:00 pm – 5:00 pm

Power System Engineering
Power Systems Design

Session Chair: Jim Harvey, *University of Michigan Hospital*
Session Organizer: Matt Dozier, *iDesign Services, Inc.*

47p1 Arc Flash Boundary Calculations Using Computer Software Tools
Mark D. Gibbs, *BWXT-Y12*

47p2 Predictive Maintenance of Vacuum Switchgear
Sheng Su and Xiangjun Zeng, *Changsha University of Science and Technology*
K. K. Li and W. L. Chan, *The HongKong Polytenic University*
Weiguo Li, *Wuhan University*

47p3 Current Methods for Conducting an Arc Flash Hazard Analysis
Aidan M. Graham, Michael Hodder, and Gary Gates, *Eaton Electrical*

47p4 A New Analytical Language for Clearing Procedures in Electrical Installations
Giuseppe Parise, *University of Rome "La Sapienza"*
Erling Hesla, *Hesla & Associates*

47p5 System Management Strategy to Monitor Insulated Power Cables
Giuseppe Parise and Luigi Martirano, *University of Rome "La Sapienza"*

47p6 Electrical Safety Related Isolation on Industrial Machines with Multiple Entry Points—Follow-up Paper: Additional Developments
William E. Anderson, *The Procter & Gamble Company*

SESSION 48

Cascade IA&B • 1:00 pm – 5:00 pm

Industrial Power Converter
Soft Switching and Resonant Converters

Session Chair: Po-Tai Cheng, *National Tsing Hua University*
Session Organizer: Bob Guenther, *NWL*

48p1 A Three-Phase Soft-Switched Isolated AC/DC Converter without Auxiliary Circuit
Staffan Norrga, Stephan Meier, and Stefan Östlund, *Royal Institute of Technology*

48p2 A Modified PWM Control Technique for Full Bridge ZVS DC–DC Converter with Equal Losses for All Devices
Liviu Mihalache, *Power Conversion Technologies Inc.*

48p3 A Novel Resonant Transition Half-Bridge Converter
B. Swaminathan and V. Ramanarayanan, *Indian Institute of Science*

48p4 A Novel Phase Shift Controlled ZVZCS Full Bridge DC–DC Converter: Analysis and Design Considerations
Xinke Wu, Chen Zhao, Junming Zhang, and Zhaoming Qian, *Zhejiang University*

48p5 A Comparative Analysis for ZVT PWM Converters with Resonant Auxiliary Circuit—RAC
M. L. Martins, J. L. Russi, and H. L. Hey, *Federal University of Santa Maria*

48p6 Realisation of the Resonant Reset ZVS Forward Converter for Distributed Power Supplies using New SiC Power Transistor
Ashot Melkonyan, *University of Kassel*
Leo Lorenz, *Infineon Technologies Asia Pacific Pte. Ltd.*

SESSION 49

Cascade IC • 1:00 pm – 5:00 pm

Industrial Power Converter
Converter Applications and Implementation Issues

Session Chair: Yuri Khersonsky, *Consultant*
Session Organizer: Seung-Ki Sul, *Seoul National University of Technology*

49p1 A 150 kVA Vector Controlled Matrix Converter Induction Motor Drive
T. F. Podlesak and D. Katsis, *S. Army Research Laboratory*
P. W. Wheeler, J. C. Clare, L. Empringham, and M. Bland, *University of Nottingham*

49p2 Model Conducted EMI Emission of Switching Modules for Converter System EMI Characterization and Prediction
Qian Liu, Fred Wang, and Dushan Boroyevich, *Virginia Polytechnic Institute and State University*

49p3 Analysis and Design of IGBT-based AC/AC Direct Converters Built of Conventional Current Source Inverter Modules
Dorin O. Neacsu, *Consultant*

49p4 Identification of Essential Coupling Path Models for Conducted EMI Prediction in Switching Power Converters
Jin Meng, Weiming Ma, Lei Zhang, and Zhihua Zhao, *Navy University of Engineering*

49p5 Conducted EMI Characteristic and Its Implications to Filter Design in Three-Phase Diode Front-End Converters
W. Shen, F. Wang, and D. Boroyevich, *Virginia Polytechnic Institute and State University*

49p6 Evaluation of the Single Sided Matrix Converter Driven Switched Reluctance Motor
A. S. Goodman, K. J. Bradley, and P. W. Wheeler, *The University of Nottingham*

49p7 Comparison and Mitigation of Common Mode Voltage in Power Converter Topologies
Sanmin Wei and Bin Wu, *Ryerson University*
N. Zargari and S. Rizzo, *Rockwell Automation Canada*

SESSION 50

Whidbey 1:00 pm – 5:00 pm

Industrial Automation & Control
Motion Controls

Session Chair: G. K. Venayagamoorty, *University of Missouri–Rolla*
Session Organizer: G. K. Venayagamoorty, *University of Missouri–Rolla*

50p1 Back-EMF Estimation-based Sensorless Control of PMSM: Robustness with Respect to Measurement Errors and Inverter Irregularities
Babak Nahid-Mobarakeh, *CREA*
Farid Meibody-Tabar and François-Michel Sargos, *Institut National Polytechnique de Lorraine*

50p2 Fuzzy Logic Controller Based Cost Effective Four-Switch, Three-Phase Inverter Fed IPM Synchronous Motor Drive System
M. Nasir Uddin, *Lakehead University*
T. S. Radwan and M. A. Rahman, *Memorial University of Newfoundland*

50p3 Application of Chaotic-Motion Motors to Industrial Mixing Processes
K. T. Chau, Shuang Ye, and Yuan Gao, *The University of Hong Kong*
J. H. Chen, *Tsinghua University*

50p4 Compensating Structural Dynamics for Servo Driven Industrial Machines with Acceleration Feedback
George W. Younkin, *Bull's Eye Research, Inc.*

50p5 Limitations of Simplified Fuzzy Logic Controller for IPM Motor Drive
Casey Butt and M. A. Rahman, *Memorial University of Newfoundland*

50p6 Digital Second Order Sliding Mode Control for a Synchronous Reluctance Motor
M. Mohamadian, *IROST*
M. M. Pedram, *Tarbiat Moallem University*
F. Ashrafzadeh, *Whirlpool Corp.*

SESSION 51

Grand I • 1:00 pm – 5:00 pm

Power Electronic Devices
Device Integration Strategies

Session Chair: Enrico Santi, *University of South Carolina*, and Hardus Odendaal, *CPES*
Session Organizer: Jean-Luc Schanen, *Laboratoire d'Electrotechnique de Grenoble*

51p1 Integrated Monolithic Over-Voltage Protection Circuit with Adjustable Threshold Voltage
M. Fisal Alkayal and Jean-Christophe Crebier, *Domaine Universitaire*

51p2 A Novel Driving and Protection Circuit for Reverse Blocking IGBT Used in Matrix Converter
Zhichao Liu, Daning Zhou, Kai Sun, and Lipei Huang, *Tsinghua University*
Kouki Matsuse, *Meiji University*
Kiyoaki Sasagawa, *Fuji Electric Advanced Technology Co., Ltd.*

51p3 Gate Driver Supply of Power Switches without Galvanic Insulation
R. Mitova, J-C. Crébier, L. Aubard, and C. Scheaffer, *INPG-CNRS*

51p4 Characterization, Parameter Identification and Modeling of a New Monolithic Emitter-Switching Bipolar Transistor
S. Musumeci, R. Pagano, and A. Raciti, *University of Catania*
C. Porto, C. Ronsisvalle, and R. Scollo, *STMicroelectronics*

51p5 A Chip-level Process for Power Switching Module Integration and Packaging
Zhenxian Liang, J. D. van Wyk, and Fred C. Lee, *Virginia Polytechnic Institute and State University*

51p6 SPETO: A Superior Power Switch for High Power, High Frequency, Low Cost Converters
Bin Zhang, Alex Q. Huang, and Bin Chen, *Virginia Polytechnic Institute and State University*
Stanley Atcitty, *Sandia National Laboratories*
Mike Ingram, *Tennessee Valley Authority*

SESSION 52

Olympic • 1:00 pm – 5:00 pm

Electrostatic Processes

Electrostatic Separation and Deposition

Session Chair: Lucian Dasculescu, *University Institute of Technology*
Session Organizer: Wamadeva Balachandran, *Brunel University*

52p1 Effect of Ambient Humidity on the Outcome of Electrostatic Separation Processes
Lucian Dascalescu, Adrian Mihalcioiu, and Adrian Samuila, *University Institute of Technology*
Amar Tilmatine and Karim Medles, *University Sidi-bel-abbès*

52p2 Preparation of Oxygen Ion Conducting Doped $LaGaO_3$ Thin Films on Porous Substrates by Pulsed Laser Deposition
Mitsugi Fumiaki, Kanazawa Seiji, Maeda Yutaka, Suita Shinya, Ohkubo Toshikazu, Nomoto Yukiharu, and Takita Yusaku, *Oita University*
Ishihara Tatsumi, *Kyushu University*

52p3 Set Point Identification and Robustness Testing of Electrostatic Separation Processes
Karim Medles, Amar Tilmatine, Farid Miloua, Abdelber Bendaoud, and Mohamed Younes, *University Djillali Liabes*
Mostéfa Rahli, *University of Sciences and Technology*
Lucian Dascalescu, *University Institute of Technology*

52p4 Characterization of Wire Corona Electrodes at Various Discharge Gaps in Electrostatic Separation Processes
Alexandru Iuga, Radu Beleca, and Roman Morar, *Technical University of Cluj-Napoca*
Adrian Samuila, and Marius Blajan, *Technical University of Cluj-Napoca* and *University Institute of Technology*
Lucian Dascalescu, *University Institute of Technology*

52p5 High-Voltage Monitoring in Electrostatic Separators
Adrian Mihalcioiu, *University Institute of Technology* and *Technical University of Cluj-Napoca*
Vasile Neamtu, *Technical University of Cluj-Napoca*
Anca Stochita and Lucian Dascalescu, *University Institute of Technology*

52p6 Considerations about Obtaining Some Different Distinct Qualities of Protection Layer of Metallic Surfaces by Covering in Different Electric Fields
Ioan Ionescu, *Valahia University of Targoviste*
Gheorghe Marin, *Institute for Research in Electrostatics*

SESSION 53

St. Helens • 1:00 pm – 5:00 pm

Industrial Drives
Drives Interface Issues

Session Chairs: Fred Wang, *Virginia Tech*, and M. Naidu, *Delphi*
Session Organizer: Frede Blaabjerg, *Aalborg University*

53p1 Experimental Evaluation of the Endangerment of Ball Bearings due to Inverter-Induced Bearing Currents 1989
A. Muetze and A. Binder, *Darmstadt University of Technology*
H. Vogel, *Siemens AG*
J. Hering, *FAG Kugelfischer AG*

53p2 Application of the Transmission Line Theory to the Frequency Domain Analysis of the Motor Voltage Stress Caused by PWM Inverters
Giovanna Oriti and Alexander L. Julian, *Power Engineering Consultants*

53p3 A Passive EMI Filter for Preventing High-Frequency Leakage Current from Flowing through the Inverter Heat Sink of an Adjustable-Speed Motor Drive System
Hirofumi Akagi and Takafumi Doumoto, *Tokyo Institute of Technology*

53p4 Evaluation of Medium Voltage Electric Propulsion Drive for Electromagnetic Compatibility Using Multi-Domain Modeling
Rob Cuzner, Craig Goshaw, Thi Nguyen, and Ashish Bendre, *DRS Power and Control Technologies*

53p5 Demonstration of Attitude Control and Bus Regulation with Flywheels
Peter Kascak and Ralph Jansen, *University of Toledo*
Barbara Kenny, *NASA Glenn Research Center*

53p6 Acoustic Noise Reduction for an Inverter-fed Three-Phase Induction Motor
Nasrin Hashemi, Robin Lisner, and Donald Grahame Holmes, *Monash University*

53p7 Integrated Doubly-fed Electric Alternator/ Active Filter (IDEA), a Viable Power Quality Solution, for Wind Energy Conversion Systems
Mehdi T. Abolhassani, Prasad Enjeti, and Hamid A. Toliyat, *Texas A&M University*

SESSION 54

5th Avenue1:00 pm – 5:00 pm

Energy Systems
Energy Systems 1

Session Chair: Greg Nolan, *PSEG Power, LLC*
Session Organizer: Greg Nolan, *PSEG Power, LLC*

54p1 Reactive Compensation Techniques to Improve the Ride-Through of Induction Generators during Disturbance
Chai Chompoo-inwai, Chitra Yingvivatanapong, K. Methaprayoon, and Wei-Jen Lee, *University of Texas at Arlington*

54p2 Integrated High Speed Intelligent Utility Tie Unit for Disbursed/Renewable Generation Facilities
Worakarn Wongsaichua, Wei-Jen Lee, and Soontorn Oraintara, *The University of Texas at Arlington*
Chiman Kwan and Frank Zhang, *Intelligent Automation, Inc.*

54p3 Optimal Operation Strategy for Cogeneration Power Plants
Shun-Hsien Huang and Wei-Jen Lee, *The University of Texas at Arlington*
Bin-Kwie Chen and Wen-Chen Chu, *Tatung University*

54p4 Fuel Consumption Minimisation of a Micro-Grid
Carlos A. Hernandez-Aramburo and Tim C. Green, *Imperial College London*

54p5 Static VAR Compensator-based Voltage Regulation Implementation of Single-Phase Self-Excited Induction Generator
Tarek Ahmed, Katsumi Nishida, and Mutsuo Nakaoka, *Yamaguchi University*

54p6 Hybrid Fuel Cell Strategies for Clean Power Generation
Kaushik Rajashekara, *Energenix Center*

Thursday Morning Sessions

SESSION 55

Cascade II • 8:00 am – 12:00 pm

Electric Machines
Linear Actuators

Session Chair: Uday Deshpande, *Black & Decker*
Session Organizer: Uday Deshpande, *Black & Decker*

55p1 Multi-Axis Maglev Nanopositioner for Precision Manufacturing and Manipulation Applications
Shobhit Verma, Won-jong Kim, and Huzefa Shakir, *Texas A&M University*

55p2 Analysis of Permanent Magnet Type Transverse Flux Linear Motor by Coupling 2D Finite Element Method on 3D Equivalent Magnetic Circuit Network Method
Ji-Young Lee and Jung-Pyo Hong, *Changwon National University*
Do-Hyun Kang, *Korea Electrotechnology Research Institute*

55p3 Force Characteristic Analysis of PMLSMs for Magnetic Levitation Stage Based on Three-Dimensional Equivalent Magnetic Circuit Network
Gyu-Hong Kang, Jin Hur, Byoung-Kuk Lee, and Jung-Pyo Hong, *Chang-won National University*

55p4 3D Motion in Magnetic Actuator Modelling
Philippe Wendling, *Magsoft Corporation*
Vincent Leconte and Christian Bataille, *Schneider Electric*
Patrick Lombard, Richard Ruiz, and Christophe Guerin, *Cedrat*

55p5 Analysis and Initial Synthesis of a Novel Linear Actuator with Active Magnetic Suspension
Anton V. Lebedev, Elena A. Lomonova, Peter G. van Leuven, and Joris Steinberg, *Eindhoven University of Technology*
Dick A. H. Laro, *Delft University of Technology*

55p6 Stator Iron Loss of Tubular Permanent Magnet Machines
Yacine Amara, Jiabin Wang, and David Howe, *University of Sheffield*

55p7 A Multi-Physics Model of Planar Electro-Active Polymer Actuators
Christoph Hackl and Dierk Schröder, *Technical University of Munich*
Hong-Yue Tang, Robert D. Lorenz, and Lih-Sheng Turng, *University of Wisconsin–Madison*

SESSION 56

Vashon • 8:00 am – 12:00 pm

Power System Engineering
Power Systems Reliability

Session Chair: Bill Braun, *Owens Corning Science & Tech.*
Session Organizer: Bill Braun, *Owens Corning Science & Tech.*

56p1 A Fuzzy-Norm Approach for Optimal Multi-Objective Single-Tuned Harmonic Filter Planning
Yuan-Lin Chen, *MingChi Institute of Technology*

56p2 Optimal Sensor Placement Technique for Locating Multiple Harmonic Sources on a Radial Distribution Feeder''
Mandhir Sahni and Wei-Jen Lee, *The University of Texas at Arlington*

56p3 Application of Colored Petri Nets to Distribution Systems Temperature Adaptive Switching Operation
Yu-Lung Ke, *Kun Shan University of Technology*

56p4 Relliability Assessment of a Backup Gas Turbine Generation System for a Critical Industry Load Using Monte Carlo Simulation Model
A. A. Chowdhury, *MidAmerican Energy Company*
D. O. Koval, *University of Alberta*

56p5 System Reliability Worth Assessment Using the Customer Survey Approach
A. A. Chowdhury and T. C. Mielnik, *MidAmerican Energy Company*
L. E. Lawton, M. J. Sullivan, and A. Katz, *Population Research Systems*
D. O. Koval, *University of Alberta*

56p6 Algorithm to Evaluate Substations Reliability with Cut and Path Sets
Miguel Vega and Héctor G. Sarmiento, *Instituto de Investigaciones Eléctricas*

56p7 Reliability and Availability Data Collection Program for Power Distribution, Power Generation, and HVAC Components of Commercial, Industrial, and Utility Installations
Peyton S. Hale Jr., *U.S. Army Corps of Engineers*
Robert G. Arno and D. David Dylis, *Alion Science and Technology*

SESSION 57

Cascade IA • 8:00 am – 12:00 pm

Industrial Power Converter
PWM and Control Techniques

Session Chair: Edison da Silva, *University of Campina Grande*
Session Organizer: Jeff Reichard, *Integrated Electronics*

57p1 A Neural-Network-based Space Vector PWM of a Five-Level Voltage-fed Inverter
Nicolau Pereira Filho, *Univ. Federal de Mato Grosso do Sul* and *Universidade Federal de Itajubá*
João O. P. Pinto, *Univ. Federal de Mato Grosso do Sul*
Bimal K. Bose, *University of Tennessee*
Luiz E. Borges da Silva, *Universidade Federal de Itajubá*

57p2 Control Method of NPC Inverter for Continuous Operation under One Phase Fault Condition
Gun-Tae Park, Tae-Jin Kim, Dae-Wook Kang, and Dong-Seok Hyun, *Hanyang University*

57p3 Harmonics Optimization of the Voltage Balancing Control for Multilevel Converter/ Inverter Systems
Zhiguo Pan and Fang Z. Peng, *Michigan State University*

57p4 A PWM Strategy for Four-Leg Voltage Source Converters and Applications to a Novel Line Interactive UPS in a Three-Phase Four-Wire System
Jang-Hwan Kim and Seung-Ki Sul, *Seoul National University*
Hyosung Kim, *Cheonan National Technical College*
Jun-Keun Ji, *Soonchunhyang University*

57p5 Harmonic Elimination for Multilevel Converter with Programmed PWM Method
Zhong Du, Leon M. Tolbert, and John N. Chiasson, *The University of Tennessee*

57p6 A Generalized Over-Modulation Methodology for Current Regulated Three-phase Voltage Source Converters
Gan Dong and Olorunfemi Ojo, *Tennessee Technological University*

57p7 Carrier-based Discontinuous PWM Modulation for Current Source Converters
Olorunfemi Ojo and Sravan Vanaparthy, *Tennessee Technological University*

SESSION 58

Cascade IC • 8:00 am – 12:00 pm

Industrial Power Converter
Utility Interface and Power Quality 2

Session Chair: Frede Blaabjerg, *Aalborg University*
Session Organizer: Sewan Choi, *Seoul National University of Technology*

58p1 Novel Topology of a Line Interactive UPS Using PQR Instantaneous Power Theory
Hyosung Kim, *Cheonan National Technical College*
Jun-Keun Ji, *Soonchunhyang University*
Jang-Hwan Kim and Seung-Ki Sul, *Seoul National University*
Kyung-Hwan Kim, *EWHA Technologies Information Company in Korea*

58p2 Protection Schemes for a Dynamic Voltage Restorer
Sidelmo M. Silva, Fernando Albert Eleutério, André de Souza Reis, and Braz J. Cardoso Filho, *Universidade Federal de Minas Gerais*

58p3 A Control Scheme in Hybrid Synchronous-Stationary Frame for PWM AC/DC Converter under Generalized Unbalanced Operating Conditions
Yongsug Suh, *ABB Switzerland Ltd.*
Thomas A. Lipo, *University of Wisconsin–Madison*

58p4 Closed-Loop State Variable Control of Dynamic Voltage Restorers with Fast Compensation Characteristics
Géza Joós, *McGill University*
Su Chen and Luiz Lopes, *Concordia University*

58p5 Performance Evaluation of PLL Algorithms for Single-Phase Grid-connected Systems
Sidelmo M. Silva, Bruno M. Lopes, Braz J. Cardoso Filho, Rodrigo P. Campana, and Wallace C. Boaventura, *Universidade Federal de Minas Gerais*

58p6 A Controlling Method for Charging Photovoltaic Generation Power Obtained by an MPPT Control Method to Series Connected Ultra-Electric Double Layer Capacitors
Nobuyoshi Mutoh and Takayoshi Inoue, *Tokyo Metropolitan Institute of Technology*

SESSION 59

Whidbey 8:00 am – 12:00 pm

Industrial Automation & Control
Electro-Thermal Issues

Session Chair: K. Suzuki, *Hatsuoi-Cho*
Session Organizer: R. McCann, *University of Arkansas*

59p1 Automatic Profiling of a Steady State Temperature Field in Thermo-Chemical Systems and Devices
Piotr Ostrowski, *Warsaw Technical University*
Wojciech A´obodziD´ski, *Industrial Institute of Electronics*
Adam Skorek, *University of Quebec at Trois-Rivieres*

59p2 Current Rating of Multicore Cables
Heinrich Brakelmann, *University of Duisburg*
Peter Lauter, *Steag Encotec Ltd.*
George Anders, *Kinectrics Inc.*

59p3 Increasing Ampacity of Cables by an Application of Ventilated Pipes
Heinrich Brakelmann, *University of Duisburg*
George Anders, *Kinectrics Inc.*

SESSION 60

Cascade IB • 8:00 am – 12:00 pm

Power Electronic Devices
Thermal Management

Session Chair: Jean-Luc Schanen, *Xerox Corporation*, and Jean-Francois de Palma, *Ferraz*
Session Organizer: Jean-Luc Schanen, *Laboratoire d'Electrotechnique de Grenoble*

60p1 Analytical Investigation of Flat Silicon Micro Heat Spreader
S. Tzanova, M. Ivanova, Y. Avenas, and C. Schaeffer, *Laboratoire d'Electrotechnique de Grenoble*

60p2 Power Density Improvement in Integrated Electromagnetic Passive Modules with Embedded Heat Extractors
Wenduo Liu and J. D. van Wyk, *Virginia Polytechnic Institute and State University*
Jaco Dirker, *Rand Afrikaans University*

60p3 Assessment of Thermo-Mechanics for an Integrated Power Electronics Switching Stage
Y. Pang, E. P. Scott, N. Zhu, J. D. van Wyk, and Z. Liang, *Virginia Polytechnic Institute and State University*

60p4 Improving the Thermal Management of AC–DC Converters using Integration Technologies
E. C. W. de Jong, J. A. Ferreira, and P. Bauer, *Delft University of Technology*

60p5 A Modular, Laminar 42/14 V DC/DC Converter Concept with Integrated Thermal Busbar
J. Popovi´ and J. A. Ferreira, *Delft University of Technology*

60p6 Thermal Analysis for Improved Packaging of Four-Channel 42 V/14 V DC/DC Converter
Seung-Yo Lee and Arthur G. Pfaelzer, *Intronics, Inc.*
J. D. van Wyk, *Virginia Polytechnic Institute and State University*

60p7 The Analyses of Pre-Arcing Period and Modeling of a High Breaking Capacity Fuse-Link in SABER
Alexandru Fogorosi and Frede Blaabjerg, *Aalborg University*

SESSION 61

Olympic • 8:00 am – 12:00 pm

Electrostatic Processes
Computational Electrostatics and Electrohydrodynamics

Session Chair: Palghet Ramesh, *Xerox Corporation*
Session Organizer: Jamal Yagoobi, *Illinois Institute of Technology*

61p1 Control of Liquid Flow Distribution Utilizing EHD Conduction Pumping Mechanism
Yinshan Feng and Jamal Seyed-Yagoobi, *Illinois Institute of Technology*

61p2 Molecular Dynamic Simulation of Electron Bubble Transport in *n*-Hexane Liquid
T. Funakawa and W. Balachandran, *Brunel University*

61p3 Modeling of Gas Reactions in Denitrification from Flue Gas by Discharge Plasma
Li-Min Dong and Zhi-Qiang Zhou, *Harbin University of Science and Technology*

61p4 Simulating Digital Exposure of Xerographic Photoreceptors using the Domain Decomposition Method
P. S. Ramesh, *Xerox Corporation*

61p5 Induction Charging of Granular Materials in an Electric Field
Y. Wu, G. S. P. Castle, and I. I. Inculet, *University of Western Ontario*

61p6 Electrostatic Droplet-Formation in Water/Oil Flow in a Microchannel System
Michihiko Nakano, Naohito Nakai, Masahumi Inoue, Kazunori Takashima, Shinji Katsura, and Akira Mizuno, *Toyohashi University of Technology*

SESSION 62

St. Helens • 8:00 am – 12:00 pm

Industrial Drives

Brushless and Synchronous Reluctance Motor Drives

Session Chairs: Alfredo Vagati, *Politecnico Di Torino*, and John Miller, *Design Services*
Session Organizer: Debiprasad Panda, *Rockwell Automation Advanced Technology*

62p1 Novel *Initial* Position Detection Technique for Three-Phase Brushless DC Motor without Position and Current Sensors
Yen-Shin Lai and Fu-San Shyu, *National Taipei University of Technology*

62p2 AC Brushless Drive with Low Resolution Hall-Effect Sensors for an Axial Flux PM Machine
F. Giulii Capponi, G. De Donato, L. Del Ferraro, and O. Honorati, *University of Rome "La Sapienza"*
M. C. Harke and R. D. Lorenz, *University of Wisconsin–Madison*

62p3 Direct Torque Control of Brushless DC Drives with Reduced Torque Ripple
Y. Liu, Z. Q. Zhu, and D. Howe, *University of Sheffield*

62p4 A New Starting Method of BLDC Motors without Position Sensor
Wook-Jin Lee and Seung-Ki Sul, *Seoul National University*

62p5 A Direct Torque Controller for Limited Speed Range Applications of Brushless Doubly-fed Reluctance Motors
Milutin Jovanovi´, *Northumbria University*
Jian Yu, *PB Power*
Emil Levi, *John Moores University*

62p6 A Maximum Torque per Ampere Vector Control Strategy for Synchronous Reluctance Motors Considering Saturation and Iron Losses
E. M. Rashad, T. S. Radwan, and M. A. Rahman, *Memorial University of Newfoundland*

62p7 Reversible Six-Phase AC Motor Drive Systems with Reduced Switch Count
C. B. Jacobina, T. M. Oliveira, and E. R. C. da Silva, *Universidade Federal de Campina Grande*
M. B. de R. Corrêa, *Universidade Federal de Campina Grande* and *Centro Federal de Educação Tecnológica de Alagoas*
C. R. da Silva, *Universidade Federal de Campina Grande* and *Centro Federal de Educação Tecnológica do Ceará*

SESSION 63

5th Avenue • 8:00 am – 12:00 pm

Power System Protection

Power Systems Protection

Session Chair: Carey J. Cook, *S&C Electric Company*
Session Organizer: Rasheet Rifaat, *Jacobs Canada, Inc.*

63p1 Fault Location Using Traveling Wave for Power Networks
Xiangjun Zeng and Zhengyi Liu, *Changsha University of Science and Technoloy*
K. K. Li, *The HongKong Polytechnic University*
Xianggen Yin, *Huazhong University of Science and Technoloy*

63p2 Real-Time Testing of a WPT-based Protection Algorithm for Three-phase Power Transformers
S. A. Saleh and M. A. Rahman, *Memorial University of Newfoundland*

63p3 Application of Numeric Protective Relay Circuit Breaker Duty Monitoring
Gerald Dalke and John Horak, *Basler Electric Company*

63p4 *Reprinted by permission:* MV Generator Low-Resistance Grounding and Stator Ground Fault Damage
Alex Wu *and* Yousin Tang*, Global Engineering Company*
Dale Finney*, GE Power Management*

63p5 Some Ground Fault Protection Schemes Implemented on FTU for Industrial Power Systems
Xiangjun Zeng, Guo Zigang, and Sheng Su, *Changsha University of Science and Technology*
K. K. Li, *The Hong Kong Polytechnic University*

63p6 Using EMTP for Evaluation of Surge Current Distribution in Metallic Gridlike Structures
Q. B. Zhou and Y. Du, *Hong Kong Polytechnic University*

63p7 Evaluation and Performance Comparisons of Digital Distance Protection Algorithms
H. Khorashadi-Zadeh, *The University of Birjand*
H. Daneshi, *Illinois Institute of Technology*

Thursday Afternoon Sessions

SESSION 64

Cascade II • 1:00 pm – 5:00 pm

Electric Machines
Induction Motors 2

Session Chair: Malakondaiah Naidu, *Delphi*
Session Organizer: Malakondaiah Naidu, *Delphi*

64p1 TEFC Induction Motors Thermal Models: A Parameter Sensitivity Analysis
A. Boglietti, A. Cavagnino, and D. A. Staton, *Politecnico di Torino*

64p2 An Efficient Thermal Model for Induction Machines
Ogbonnaya I. Okoro, *University of Nigeria*
Bernd Weidemann, *University of Kassel*
Olorunfemi Ojo, *Tennessee Tech University*

64p3 Implementation and Calorimetric Verification of Models for Wide Speed Range Three-Phase Induction Motors for Use in Washing Machines
P. D. Malliband and R. A. McMahon, *Cambridge University*

64p4 No Tooling Cost Process for Induction Motors Energy Efficiency Improvements
A. Boglietti, A. Cavagnino, L. Ferraris, and M. Lazzari, *Politecnico di Torino*
G. Luparia, *FIMET Motori & Riduttori*

64p5 Design Optimization of Induction Motors for Aerospace Applications
Christian Koechli and Yves Perriard, *Swiss Federal Institute of Technology Lausanne*
Barry K. Fussell, *University of New Hampshire*
Steven R. Prina, *Applimotion, Inc.*
Darwin A. James, *Parker Hannifin*

64p6 The Implications of Winding Faults in Induction Motor Drives
C. Gerada, K. J. Bradley, M. Sumner, P. Wheeler, S. Pickering, and J. Clare, *University of Nottingham*
C. Whitley and G. Towers, *Smiths Aerospace Actuation Systems*

64p7 Split-Phase Claw-Pole Induction Machines with Soft Magnetic Composite Cores
Ronghai Qu and Ralph Carl, *General Electric Company*
Gerald B. Kliman, *affiliation not indicated*

SESSION 65

Cascade IA • 1:00 pm – 5:00 pm

Power Electronic Devices
Semiconductor Models and Capacitors

Session Chair: John Siefken, *ABB Semiconductors*
Session Organizer: Jean-Luc Schanen, *Laboratoire d'Electrotechnique de Grenoble*

65p1 The Use of Condition Maps in the Design and Testing of Power Electronic Circuits and Devices
A. T. Bryant, N-A. Parker-Allotey, and P. R. Palmer, *Cambridge University*

65p2 Multi-Level Device Models Developed for the Virtual Test Bed (VTB)
X. Wang, L. Lu, S. Pytel, D. Franzoni, and E. Santi, *University of South Carolina*
J. L. Hudgins, *University of Nebraska*
P. R. Palmer, *University of Cambridge*

65p3 Physics-based Modeling of NPT and PT IGBTs at Deep Cryogenic Temperatures
A. Caiafa, A. Snezhko, E. Santi, and R. Prozorov, *University of South Carolina*
J. L. Hudgins, *University of Nebraska*
P. R. Palmer, *University of Cambridge*

65p4 Destruction-free Parameter Extraction for a Physics-based Circuit Simulator IGCT Model
X. Wang, J. L. Hudgins, and E. Santi, *University of South Carolina*
P. R. Palmer, *University of Cambridge*

65p5 Half-Order Modelling of Supercapacitors
D. Riu and N. Retière, *Domaine Universitaire*
D. Linzen, *University of Technology*

65p6 Stacked Foil Type Large-Sized Aluminum Electrolytic Capacitors
Genho Takano, Makoto Shimizu, and Kentar Nakaaki, *Nippon Chemi-Con Corporation*
Mitchell Weaver and Masayuki Kudo, *United Chemi-Con, Inc.*

65p7 DC Bus Electrolytic Capacitor Stress in Adjustable-Speed Drives under Input Voltage Unbalance and Sag Conditions
Kevin Lee and William E. Berkopec, *Eaton Electrical*
Thomas M. Jahns and Giri Venkataramanan, *University of Wisconsin–Madison*

SESSION 66

Cascade IC • 1:00 pm – 5:00 pm

Power System Engineering/Power System Protection/CS

Power Systems Engineering and Protection

Session Chair: Jim Harvey, *University of Michigan Hospital*
Session Organizer: Matt Dozier, *iDesign Services, Inc.*

66p1 Practical Problems Associated with the Operation of ASDs Based on Active Front End Converters in Power Distribution Systems
Luis Morán, José Espinoza, and Mauricio Ortíz, *Universidad de Concepción*
José Rodríguez, *Universidad Técnica Fed. Sta. María*
Juan Dixon, *Universidad Católica de Chile*

66p2 Voltage Sag Analysis and Solution for an Industrial Plant with Embedded Induction Motors
Angel Felce, Guillermo Matas, and Ysmael Da Silva, *Inelectra S.A.C.A.*

66p3 Modeling Effects of Voltage Unbalances in Industrial Distribution Systems with Adjustable Speed Drives
Kevin Lee, *Eaton Electrical*
Giri Venkataramanan and Thomas M. Jahns, *University of Wisconsin–Madison*

66p4 Impact Assessment of Automated Meter Reading Systems on Diary Cows
Arindam Maitra and Doug Dorr, *EPRI PEAC Corp.*

66p5 The Application of Silicon Avalanche Diodes on Low-Voltage Power Systems
Andreas Beutel and John Van Coller, *University of the Witwatersrand*

SESSION 67

Whidbey • 1:00 pm – 5:00 pm

Industrial Automation & Control

Intelligent Controls & Applications

Session Chair: A. Rubaai, *Howard University*
Session Organizer: Z. Gao, *Cleveland State University*

67p1 Neural Network Based Sensorless Maximum Wind Energy Capture with Compensated Power Coefficient
Hui Li, K. L. Shi, and P. McLaren, *Florida State University*

67p2 A Current-Sensorless Three-Phase Active Rectifier with Fuzzy-Logic Control
C. Cecati, *Univ. of L'Aquila*
A. Dell'Aquila, A. Lecci, and M. Liserre, *Polytechnic of Bari*

67p3 Fuzzy Logic Average Current-Mode Control for DC–DC Converters Using an Inexpensive 8-Bit Microcontroller
Dake He and R. M. Nelms, *Auburn University*

67p4 Hardware Implementation of an Adaptive Network-based Fuzzy Controller for DC–DC Converters
Ahmed Rubaai and Abdul Ofoli, *Howard University*

67p5 Development of a Self-Tuned Neuro-Fuzzy Controller for Induction Motor Drives
M. Nasir Uddin and Hao Wen, *Lakehead University*

67p6 Modified Takagi-Sugeno Fuzzy Logic Based Controllers for a Static Compensator in a Multimachine Power System
Salman Mohagheghi and Ronald G. Harley, *Georgia Institute of Technology*
Ganesh K. Venayagamoorthy, *University of Missouri–Rolla*

67p7 Dynamic Optimization of a Multimachine Power System with a FACTS Device Using Identification and Control ObjectNets
Ganesh K. Venayagamoorthy, *University of Missouri–Rolla*

SESSION 68

Cascade IB • 1:00 pm – 5:00 pm

Power Electronic Devices
Filtering and EMI

Session Chair: Rich Lukaszewski, *Rockwell*, and Adam Konopka, *Baldor Electric*
Session Organizer: Jean-Luc Schanen, *Laboratoire d'Electrotechnique de Grenoble*

68p1 Analytical Estimation of Common Mode Conducted EM in PWM Inverter
Xuejun Pei, Kai Zhang, Yong Kang, and Jian Chen, *Huazhong University of Science and Technology*

68p2 EMC Study of a Three Phase Inverter-fed Motor Drives
B. Revol, J. Roudet, and J. L. Schanen, *Domaine Universitaire*
P. Loizelet, *Schneider Toshiba Inverter Europe*

68p3 Active and Passive Series Compensation of Common Mode Voltage in Adjustable Speed Drive System
Adam Kempski, Robert Smolenski, Emil Kot, and Zbigniew Fedyczak, *University of Zielona Gora*

68p4 Extraction of Parasitic Parameters of EMI Filters Using Scattering Parameters
Shuo Wang, W. G. Odendaal, and F. C. Lee, *Virginia Polytechnic Institute and State University*

68p5 Application of Structural Winding Capacitance Cancellation for Integrated EMI Filters by Embedding Conductive Layers
Rengang Chen, J. D. van Wyk, Shuo Wang, and W. G. Odendaal, *Virginia Polytechnic Institute and State University*

SESSION 69

Olympic • 1:00 pm – 5:00 pm

Electrostatic Processes
Electrostatic Measurement and Control

Session Chair: Norbert Grass, *Siemens*
Session Organizer: William Greason, *University of Western Ontario*

69p1 Analysis, Design and Experimentation of a High Voltage Power Supply for Ozone Generation Based on the Current-fed Parallel-Resonant Push–Pull Inverter
J. M. Alonso, J. García, A. J. Calleja, J. Ribas, and J. Cardesín, *Universidad de Oviedo*

69p2 A Critical Approach to Measure Streaming Current: Case of Fuels Flowing through Conductive and Insulating Polymer Pipes
J. Vazquez-Garcia, J. Rivenc, and A. Agneray, *Renault*
T. Paillat and G. Touchard, *Laboratoire d'Etudes Aérodynamiques*

69p3 Characteristic Evaluation for Synchronous Motors Using a Universal Drive System
Yoko Amano, *Maizuru National College of Technology*
Satoshi Ogasawara, *Utsunomiya University*

69p4 Imbalance of the Charge on a Carrier Moving through a Gaseous Medium
Zdenek Kucerovsky and William D. Greason, *The University of Western Ontario*

69p5 Measurement of Flowing Charges with an Electrostatic Voltmeter
Maciej A. Noras, *Trek, Inc.*

69p6 Electrification of Jets of Diesel Oil: Comparison between Malvern and PDPA Measurements
P. Baudel, P. Braud, C. Refin, and H. Romat, *Laboratoire d'Etudes Aérodynamiques*
A. Agneray, *Renault*

SESSION 70

St. Helens • 1:00 pm – 5:00 pm

Industrial Drives
Drives Applications

Session Chairs: Michael Giesselmann, *Texas Tech. University*, and Vladimir Blasko, *Otis Elevator*
Session Organizer: Sudip Mazumder, *University of Illinois at Chicago*

70p1 Development of a Traction System for the Gauge Changing Train
Keiichiro Kondo, Hiroshi Hata, Kenichi Uruga, and Nobuo Terauchi, *Railway Technical Research Institute*

70p2 Different Viable Torque Control Schemes of Induction Motor for Electric Propulsion Systems
M. Vasudevan, *St. Joseph's College of Engineering*
R. Arumugam, *Anna University*

70p3 Torque Tracking Strategy for Anti-Slip Control In Railway Traction Systems with Common Supplies
J. N. Verhille, *Siemens Transportation Systems* and *L2EP Lille*
A. Bouscayrol, P. J. Barre, J. C. Mercieca, J. P. Hautier, and E. Semail, *L2EP Lille*

70p4 A Control Method to Suitably Distribute Electric Braking Force between Front and Rear Wheels in Electric Vehicle Systems with Independently Driven Front and Rear Wheels
Nobuyoshi Mutoh and Kazuya Takita, *Tokyo Metropolitan Institute of Technology*

70p5 Design and Control of a Kilo-Amp DC/AC Inverter for Integrated Starter-Generator (ISG) Applications
Jingbo Liu, Jiangang Hu, and Longya Xu, *The Ohio State University*

70p6 Double-fed Asynchronous Motor-Generator Equipped with a Three-Level VSI Cascade
A. Hodder and J.-J. Simond, *Swiss Federal Institute of Technology of Lausanne*
A. Schwery, *Alstom Power*

70p7 The Electrical Variable Transmission
Martin J. Hoeijmakers and Jan A. Ferreira, *Delft University of Technology*

SESSION 71

5th Avenue • 1:00 pm – 5:00 pm

Energy Systems
Energy Systems 2

Session Chair: Greg Nolan, *PSEG Power, LLC*
Session Organizer: Greg Nolan, *PSEG Power, LLC*

71p1 Model of a Regenerative Fuel Cell-Supported Wind Turbine AC Power Generating System
W. Carter and B. M. Diong, *The University of Texas at El Paso*

71p2 Energy Management of Hydrogen-based Stand-Alone Renewable Energy System by Using Boost and Buck Converters
Kodjo Agbossou, Sousso Kélouwani, Adil Anouar, and Mohanlal Kolhe, *Université du Québec à Trois-Rivières*

71p3 Remote Micro-Hydroelectric Power Generation System
Ben Seitz, Cesar Salire, Gary Harwood, James N. Peterson, and Herbert L. Hess, *affiliations not indicated*

71p4 State Space Modeling of Parallel Self-Excited Induction Generators for Wind Farm Simulation
F. A. Farret, *The Federal University of Santa Maria*
B. Palle and M. Godoy Simões, *Colorado School of Mines*

71p5 Modeling, Control and Power Quality Evaluation of a PEM Fuel Cell Based Power Supply System for Residential Use
M. Tanrioven and M. S. Alam, *University of South Alabama*

Conferences & Workshops

IAS Sponsored and Cosponsored 2004 Conferences and Workshops	
Date & Location	Conference Name & Website
Feb 10-13 Oakland, CA USA	PCIC Electrical Safety Workshop http://www.ewh.ieee.org/cmte/ias-esw/annual.htm
Feb 22-26 Anaheim, CA USA	Applied Power Electronics Conference http://www.apec-conf.org/
Mar 29-31 Lexington, KY USA	International Appliance Technical Conference http://www.iatc.net/
Mar 31-Apr 2 Edinburgh, UK	Power Electronics, Machines and Drives http://www.iee.org/oncomms/pn/powerca/pemd02.cfm
Apr 26-28 Chattanooga, TN USA	Cement Industry Technical Conference http://www.ieeepca2004.org/
Apr 26-28 Vancouver, BC, Canada	Advanced Process Control Applications Workshop http://www.ieee-ias.org/apc2004
May 1-6 Clearwater Beach, FL	Industrial & Commercial Power Systems Technical Conference http://www.ewh.ieee.org/soc/ias/icps2004
May 12-14 Berlin, Germany	Inter-Society Workshop http://www.ewh.ieee.org/r8/germany/ias-pels/
May 19-24 Aeolian Islands, Italy	Future Energy and Power Processing Conference
May 20-22 Brasov, Romania	Optimization of Electrical and Electronic Equipment
May 23-25 Scottsdale, AZ USA	Rural Electric Power Conference
May 27-28 Basel, Switzerland	Petroleum and Chemical Industry Technical Conference - Europe http://www.vdi.de/vdi/english/organisation/schnellauswahl/fgkf/gma/tagungen/07087/index.php
Jun 20-24 Aachen, Germany	Power Electronics Specialists Conference http://www.pesc04.rwth-aachen.de/
Jun 27 – Jul 1 Victoria, BC Canada	Pulp and Paper Industry Conference http://www.pulppaper.org/
Aug 13-15 Santa Clara, California USA	IEEE Symposium on Product Safety Engineering http://ewh.ieee.org/soc/pses/symposium/index.html
Sep 2-4 Riga, Latvia	International Power Electronics and Motion Control Conference http://www.rtu.lv/epe-pemc2004

www.ewh.ieee.org/soc/ias/products-services/conferences-workshops.htm

Sep 13-15 San Francisco, CA USA	Petroleum and Chemical Industry Technical Conference http://www.ieee-pcic.org/
Oct 3-7 Seattle, WA, USA	IAS Annual Meeting and Technical Conference http://www.ieee.org/ias2004
Nov 1-3 Jeju Island, Korea	International Conference on Electric Machines and Systems http://www.icems2004.com/
Nov 9-10 New Delhi, India	Petroleum and Chemical Industry Conference http://www.ewh.ieee.org/r10/delhi/pci-india.pdf
IAS Sponsored and Cosponsored 2005 Conferences and Workshops	
Date & Location	Conference Name & Website
Feb. 8-11 Denver, Colorado USA	IEEE/IAS/PCIC Electrical Safety Workshop http://www.ewh.ieee.org/cmte/ias-esw
Mar 6-10 Austin, Texas USA	Applied Power Electronics Conference http://www.apec-conf.org/
Mar 28-30 Chicago, Illinois USA	International Appliance Technical Conference
May 8-11 Saratoga Springs, New York USA	Industrial & Commercial Power Systems Technical Conference http://www-ee.uta.edu/icps
May 8-10 San Antonio, Texas USA	Rural Electric Power Conference http://www.ieeerepc.org/
May 9-11 Vancouver, Canada	Advanced Process Control Applications for Industry Workshop http://ieee-ias.org/apc2005/
May 15-18 San Antonio, Texas USA	International Electric Machines and Drives Conference http://www.iemdc05.com/
May 15-19 Kansas City, Missouri USA	Cement Industry Technical Conference http://www.ieeepca2005.org/
Sep 7-9 Vienna, Austria	Electric Machines, Power Electronics and Drives Conference http://www.myers-smith.org/sdemped/sdemped05.html
Sep 11-14 Denver, Colorado USA	Petroleum and Chemical Industry Technical Conference http://www.ieee-pcic.org/
Sep 12-14 Dresden, Germany	European Power Electronics Conference http://elektron.epe-association.org/epe/
Sep 18-22 Berlin, Germany	International Telecommunications Energy Conference
Oct 2-6 Hong Kong	Industry Applications Society Annual Meeting http://ias.ieee.org.hk/ias2005
Oct 2-6 Hong Kong	IAS Society Chapters Annual Workshop

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ABB Semiconductors Hospitality Room
Monday, October 4
Tuesday, October 5
6:00 pm - 10:00 pm
Niko Room

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Powerex Hospitality Room
Monday, October 4
Tuesday, October 5
6:00 pm - 9:00 pm
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