Technical Presentations

Monday, June 17, 2013

Poster Session 1: Power Electronics, Motor Drives, and Vehicular Applications

Session Chairs:
Dr. Avoki M. Omekanda, Staff Research Engineer, General Motors – Global R&D Center
Dr. Emad Dlala, Application Engineer – Ansys Inc.

Monday, June 17, 2013
12:00 PM – 2:00 PM
Venue: Great Lakes Center (Exhibit Hall)

PS-1 A Simplified Power Loss Calculation Method for PFC Boost Topologies 1
Fariborz Musavi1, Deepak S. Gautam1, Wilson Eberle2 and William G. Dunford2
1Delta-Q Technologies Corp., Canada, 2The University of British Columbia, Canada

PS-2 A Novel Highly Efficient Tank-Less Inverter for Transportation Applications N/A
Abhinava Chaitanya Moreddy and Venkataraman Aditya
Nanyang Technological University, Singapore

PS-3 Neutral-Point Voltage Balancing of Three-Level Inverter Using Modified 6
Carrier-Based Space Vector Modulation and THD Comparison with the Two-Level Inverter
Lekha Sejpal1, Luiz Lopes1, Amar Mohammed2 and Sheldon Williamson1
1Concordia University, Canada, 2TM4 Inc., Canada

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Parampreet Kaur Toor1, Ali Emadi1 and Hassan A. Kojori2
1McMaster University, Canada, 2Honeywell Aerospace, Canada

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Abdul Lateef4, Ali Emadi1 and Hassan Kojori2
1McMaster University, Canada, 2Honeywell Aerospace, Canada

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Matthew Bloom, Geng Niu and Mahesh Krishnamurthy
Illinois Institute of Technology, USA

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Seyoung Kim and Sheldon Williamson
Concordia University, Canada

An Electro-Thermal Cycle-Lifetime Estimation Model for LiFePO4 Batteries
Junyi Shen, Serkan Dusmez, and Alireza Khaligh
University of Maryland at College Park, USA

Study of Permanent Magnet Machine Based Flywheel Energy Storage System for Peaking Power Series Hybrid Vehicle Control Strategy
Xiaomin Lu, Lakshmi Varaha Iyer, Kaushik Mukherjee and Narayan Kar
University of Windsor, Canada

Hybrid Energy Storage System (HESS) in Vehicular Applications: A Review On Interfacing Battery And Ultra-capacitor Units
Amir Ostadi¹, Mehrdad Kazerani¹ and Shih-Ken Chen²
¹University of Waterloo, Canada, ²General Motors, USA

Fault Sensitive Modeling and Diagnosis of PEM Fuel Cell for Automotive Applications
Ali Mohammadi¹, David Bouquain¹, Deatrice Bouriot¹, Abdesslem Djerdir¹ and Davood Khaburi²
¹Université de Technologie de Belfort-Montbéliard, France, ²University of Science and Technology, Iran

Pulse Charger with Zero Current Switching and Isolation for Electric Vehicles and Renewable Energy Applications
Sunil Abeyratne¹, Parami Wijesinghe1 and Chamika Liyanagedera2
¹University of Peradeniya, Sri Lanka, ²Purdue University, USA

Review and Comparison of Inductive Charging Circuit Topologies for Electric and Hybrid Electric Vehicles
Bernardo Peschiera and Sheldon Williamson
Concordia University, Canada

Wavelet-Transform Based Energy and Power Decoupling Strategy for an Ultracapacitor-Battery Hybrid Power-Split Gear Powertrain
Serkan Dusmez and Alireza Khaligh
University of Maryland at College Park, USA

Study of the Electric Power Balance in a Vehicle for the Choice of the Battery
Gianmarco Capano, Maurizio Mozzone and Narayan Kar
University of Windsor, Canada

Extended Kalman Filter Based Battery State Of Charge (SOC) Estimation for Electric Vehicles
Chenguang Jiang, Allan Taylor, Chen Duan and Kevin (Hua) Bai
Kettering University, USA
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Venugopal Prasanth and Pavol Bauer
Delft University of Technology, Netherlands

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University of Hawaii at Manoa, USA

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Ganga Jayaraman and Zenon Szulyk
Woodward Inc., USA

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Nina Naghizadeh and Sheldon Williamson
Concordia University, Canada

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Frederick Klatt
Best Electric Machine, USA

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Adam Willwerth and Matthew Roman
Electro Static Technology, USA

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Pinkymol Harikrishna Raj, Ali Iftekhar Maswood and Aditya Venkataraman
Nanyang Technological University, Singapore

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Wayne State University, USA

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Yong Jiang, Zhi Yang and Mahesh Krishnamurthy
Illinois Institute of Technology, USA

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Salem Alloune
University of Bejaia, Algeria

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Aravind Samba Murthy and David Taylor
# Technical Session 1: Power Electronics- I

**Session Chairs:**  
Dr. Chandra Namuduri, Technical Fellow – General Motors R&D Center  
Elias Aymana, Cummins Generation  

Monday, June 17, 2013  
2:00 PM – 3:20 PM  
Venue: Regency J-K

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Coffee Break  
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# Technical Session 2: Advances in Transportation (Industry Presentation-Only session)

**Session Chairs:**  
John Gibson, Chief Engineer – Chrysler Group LLC  
Silva Hiti, Technical Fellow – General Motors  

Monday, June 17, 2013  
4:20 PM – 5:40 PM  
Venue: Regency J-K

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Dr. Srdjan Lukic, North Carolina State University
Dr. Baiming Shao, Technical Specialist - Mercedes Benz R&D

Tuesday, June 18, 2013

Venue: Great Lakes Center (Exhibit Hall)

PS-29 Electric Motor Control for Hybrid Electric Vehicles based on Different Driving Cycles
Yi Hou¹, Alexandre Ravey², David Bouquain², Fei Gao², Abdellatif Miraoui² and Weiguo Liu¹
¹Northwestern Polytechnical University, China, ²Universite de technologie de Belfort-Montbéliard, France

PS-30 Modeling and Simulation of a Photovoltaic (PV) Based Inductive Power Transfer Electric Vehicle Public Charging Station
Dimko Miskovski and Sheldon Williamson
Concordia University, Canada

PS-31 Comparison Criteria for Hybrid/Electric Vehicles Traction System Architectures
Alexandre Battiston¹, Jean-Philippe Martin¹, El-Hadj Millani², Babak Nahid-Mobarakheh¹, Serge Pierfederici¹ and Farid Meibody-Tabar¹
¹Universite de Lorraine, France, ²IFP Energies Nouvelles, France

PS-32 Dynamic Decoupling Control of a Centrifugal Compressor for Fuel Cell Systems for Transportation Applications
Dongdong Zhao¹, Qing Zheng², Fei Gao¹, David Bouquain¹, Bo Li² and Abdellatif Miraoui¹
¹University of Technology of Belfort-Montbéliard, France, ²Gannon University, USA

Swathi Rao¹, Berthold Florence², ³, Pandurangavittal Koppal¹, Blunier Benjamin², Bouquain David², Sheldon Williamson³ and Miraoui Abdellatif²
¹National Institute of Technology, India, ²University of Technology of Belfort-Montbéliard, France, ³Concordia University, Canada

**PS-34** Analysis of Electric Vehicle Impacts in New Mexico Urban Utility Distribution Infrastructure
Brian Arellano¹, Santiag Sena², Shahin Abdollahy², Olga Lavrova², Sara Stratton¹, and Jon Hawkins¹
¹Public Utility Service Company of New Mexico, USA, ²University of New Mexico, USA

**PS-35** Improving the Performance of an Active Power Filter as a Part of a Next Generation, Multifunctional, High Power, Electrical Vehicle Charging Station
Yongbin Chu, Shuo Wang and Russell Crosier

**PS-36** Development of a Predictive Model for Regenerative Braking System
Andrea Caratti, Gabriele Catacchio, Carlo Gambino and Narayan Kar
University of Windsor, Canada

**PS-37** Degraded Control Strategy Using State-of-Health in Fuel Cell Hybrid Electric Vehicle
Sebastien Faivre, Alexandre Ravey, David Bouquain and Abdesslem Djerdir
University of Technology of Belfort-Montbéliard, France

**PS-38** Electric Go-Kart with Battery-Ultracapacitor Hybrid Energy Storage System
Wellington Avelino¹, Fellipe Garcia², Andre Ferreira³ and Jose Antenor Pomilio¹
¹University of Campinas, Brazil, ²Ekion Electric Vehicles Technologies, Brazil, ³Federal University Juiz de Fora, Brazil

**PS-39** Systematic Approach to the Modeling and Control of Hybrid Electric Vehicle Powertrains
David Taylor
Georgia Institute of Technology, USA

**PS-40** Comprehensive Energy Loss Minimization Strategy for Parallel Plug-in Hybrid Electric Vehicles
Changjian Hu, Yimin Gao and Alex Q. Huang
North Carolina State University, USA

**PS-41** Design Study of Parallel HEV Drive Train with Full Size Engine
Lin Lai and Mehrdad Ehsani
Texas A&M University, USA

On Electrification of Mass Excavation
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Volvo Construction Equipment, Sweden

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Alexandre Ravey1, Rui Wang1, Srdjan M. Lukic2 and Abdellatif Miraoui1
1University of Technology of Belfort-Montbéliard, France, 2North Carolina State University, USA

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Kenneth Brown
Leviton Manufacturing Co. Inc., USA

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Bogota DC
Mateo Cortes Guzman, Jaime Ramirez Parra and Javier Rosero Garcia
Universidad Nacional de Colombia, Colombia

PS-46  The Critical Role of Microgrids in Transition to a Smarter Grid: A Technical Review 267
Adhithya Ravichandran, Pawel Malysz, Shahin Sirouspour and Ali Emadi
McMaster University, Canada

PS-47  A Test Bed to Monitor Smart Grid Power Quality 274
Nafia Al-Mutawaly1,2 and Mehdi Alimardani2
1Mohawk College, Canada, 2McMaster University, Canada

PS-48  Maximizing the Penetration of Plug-In Electric Vehicles in Distribution Network 278
Junhui Zhao, Yang Wang, Caisheng Wang, Feng Lin and Le Yi Wang
Wayne State University, USA

PS-49  The Impact of PHEV/EV Chargers on Residential Loads - A Case Study 284
Laith Al-Musawi1, Rocky Tran1, Michael Dang2 and Nafia Al-Mutawaly1,3
1McMaster University, Canada, 2Hydro One Networks, Canada, 3Mohawk College, Canada

PS-50  On-Road Charging of Electric Vehicles 288
Pavol Bauer and Theodora-Elli Stamati
Delft University of Technology, Netherlands

PS-51  The Impact of PHEV/EV Chargers on Residential Loads - A Case Study 296
Laith Al-Musawi1, Rocky Tran1, Michael Dang2 and Nafia Al-Mutawaly1,3
1McMaster University, Canada, 2Hydro One Networks, Canada, 3Mohawk College, Canada

PS-52  Comprehensive Modeling of Electric Vehicles to Analyze their Performance Based 300
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Saeedeh Hamidifar, Mahdi Mousavi and Narayan Kar
University of Windsor, Canada

PS-53  Cadmium Telluride Solar Cell: From Device Modeling to Electric Vehicle Battery 305
Management
Khalid Nazmus Sakib, Kabir Zahangir and Sheldon Williamson
Technical Session 3: Transportation- I
Session Chairs:
Shashi Velnati, Manager – Chrysler Group LLC
Dr. Sanjaka Wirasingha, Chrysler Group LLC

Tuesday, June 18, 2013
2:00 PM – 3:20 PM
Venue: Regency J-K

S3-1 Benchmarking EV and HEV Power Electronics and Electric Machines
Tim Burress and Steven Campbell
Oak Ridge National Laboratory, USA

S3-2 A Novel Fixed Displacement Electric Hydraulic Hybrid (EH2) Drivetrain for City Vehicles
Yingguang Sun¹, Jose Garcia² and Mahesh Krishnamurthy¹
¹Illinois Institute of Technology, USA, ²Purdue University, USA

S3-3 PEV Demand Flexibility and its Impact on the Electric Power System
Mahdi Kefayati and Ross Baldick
University of Texas at Austin, USA

S3-4 An Average Modeling approach for Mobile Refrigeration Hybrid Power Systems with Improved Battery Simulation
Yue Cao and Philip Krein
University of Illinois at Urbana-Champaign, USA

Technical Session 4: Energy Storage- I
Session Chairs:
Dr. Tae-Kyung Lee, Research and Advanced Engineering – Ford Motor Company
Dr. Adam Timmons, Technical Specialist – Chrysler Group LLC

Tuesday, June 18, 2013
2:00 PM – 3:20 PM
Venue: Regency J-K
S4-1  Adaptive Online Battery Parameters/ SOC/ Capacity Co-estimation  
Habiballah Rahimi-Eichi and Mo-Yuen Chow  
North Carolina State University, USA

S4-2  Sizing of ICE and Lithium-Ion Battery for Series Hybrid Vehicle over Life Cycle with Battery Aging  
Daniela Chrenko, Zul Hilmi Che Daud, Zainab Asus, El-Hassane Aglzim, Luis Le Moyne, and Shiyou Gan  
University of Bourgundy, France

S4-3  Adaptive Temperature Monitoring for Battery Thermal Management  
Ienkaran Arasaratnam¹, Jimi Tjong², Ahmed Ryan¹ Mohammed El-Sayed¹, and Saeid Habibi¹  
¹McMaster University, Canada, ²University of Windsor, Canada

S4-4  Simulation of Internal Short Circuits on Lithium Ion Cells  
Alvin Wu¹, Mahmood Tabaddor², Carl Wang² and Judith Jeevarajan³  
¹UL LLC, USA, ²UL LLC, Taiwan, ³NASA Johnson Space Center, USA

Coffee Break  
3:20 PM – 4:20 PM

Technical Session 5: Conductive and Inductive Charging  
Session Chairs:  
Richard Scholer, Senior Technical Specialist – Chrysler Group LLC  
Deepak S. Gautam, Lead Power Electronics Engineer – Delta-Q Technologies

Tuesday, June 18, 2013  
4:20 PM – 5:40 PM  
Venue: Regency G-H

S5-1  Oak Ridge National Laboratory Wireless Power Transfer Development for Sustainable Campus Initiative  
John Miller, Omer Onar, Steven Campbell, Chester Coomer, Cliff White and Larry Seiber  
Oak Ridge National Laboratory, USA

S5-2  Design of a Zero-Voltage-Switching Large-Air-Gap Wireless Charger with Low Electrical Stress for Plug-In Hybrid Electric Vehicles  
Chen Duan, Chenguang Jiang, Allan Taylor and Kevin (Hua) Bai  
Kettering University, USA
Technical Session 6: Power Electronics- II

Session Chairs:
Dr. Rashmi Prasad, Staff Research Engineer – General Motors R&D Center
Dr. Zhong Nie, Technical Specialist – Chrysler Group LLC

Tuesday, June 18, 2013
4:20 PM – 5:40 PM
Venue: Regency G-H

S6-1 Voltage Control of a Single Phase, Single-Stage, Isolated AC-DC Converter
Nathan Weise and Nathan Reimensnyder
University of Maine, USA

S6-2 Efficiency Comparison of SiC and Si-Based Bidirectional DC-DC Converter
Di Han, Jukkrit Noppakunkajorn and Bülent Sarlioglu
University of Wisconsin-Madison, USA

S6-3 A DSP-Based Zero Current and Discontinuous Conduction Mode Detection Method
Colin Clark	extsuperscript{1}, Wilson Eberle	extsuperscript{1} and Fariborz Musavi	extsuperscript{2}

	extsuperscript{1}University of British Columbia, Canada, ~	extsuperscript{2}Delta-Q Technologies Corp., Canada

S6-4 Energy Efficiency and Fault Tolerance Comparison of DC/DC Converter Topologies for Fuel Cell Electric Vehicles
Damien Guilbert, Arnaud Gaillard, Abdoul N'Diaye and Abdesselam Djerdir
University of Technology of Belfort-Montbéliard, France

Wednesday, June 19, 2013

Technical Session 7: Motor Drives

Session Chairs:
Dr. Bin Wu, Manager – Mercedes Benz R&D
Dr. Young-Joo Lee, Technical Specialist – Chrysler Group LLC

Wednesday, June 19, 2013
8:30 AM – 10:10 AM
Venue: Stearns Knight

S7-1 Model Reference Adaptive System-Based Speed Estimators for Sensorless Control of Interior Permanent Magnet Synchronous Machines 411
Yue Zhao1, Wei Qiao1 and Long Wu2
1University of Nebraska-Lincoln, USA, 2John Deere Electronic Solutions, USA

S7-2 Loss Modeling and Comparison of VSI and RB-IGBT based CSI in Traction Drive Applications 417
Gui-Jia Su and Puqi Ning
Oak Ridge National Laboratory, USA

S7-3 Electric Motor Control for Hybrid Electric Vehicles based on Different Driving Cycles 424
Yi Hou1, Alexandre Ravey2, David Bouquain2, Fei Gao2, Abdellatif Miraoui2 and Weiguo Liu1
1Northwestern Polytechnical University, China, 2University of Technology of Belfort-Montbeliard, France

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Nicolas Leboeuf1, Thierry Boileau1, Babak Nahid-Mobarakeh1, Noureddine Takorabet1, Farid Meibody-Tabar1 and Guy Clerc2
1University of Lorraine, France, 2Lyon 1 University, France

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Anas Labak, Gholam-Abbas Nazri and Narayan Kar
University of Windsor, Canada

Technical Session 8: Energy Storage- II
Session Chairs:
Anand Sankaran, Executive Technical Leader & Chief Engineer – Ford Motor Company
Dr. Hong H. Yang, Manager – Chrysler Group LLC

Wednesday, June 19, 2013
8:30 AM – 10:10 AM
Venue: Pierce Arrow

S8-1 Enhanced Battery/Ultracapacitor Hybrid Energy Storage System and Split Powertrain for Next Generation Performance Vehicles 441
Steven Rogers1, Andrew Saul1, Serkan Dusmez2 and Alireza Khaligh2
1Genovation Cars Inc., USA, 2University of Maryland at College Park, USA

High Temperature - High Energy Density Polymer-Coated Glass Capacitors 444
S8-2 Mohan Prasad Manoharan¹, Michael Lanagan¹, Shihai Zhang², Douglas Kushner², Chen Zou² and Takashi Murata³
¹Pennsylvania State University, USA, ²Strategic Polymer Sciences, USA, ³Nippon Electric Glass, Japan

S8-3 Optimal Sizing of the Energy Storage System (ESS) in a Battery-Electric Vehicle
Amir Ostadi¹, Mehrdad Kazerani¹ and Shih-Ken Chen²
¹University of Waterloo, Canada, ²General Motors, USA

S8-4 Characterization of a Commercial Automotive Lithium Ion Battery using Kalman Filter
Moemen Daboussy, Daniela Chrenko, El-Hassane Aglizim, Zul Hilmi Che Daud and Luis Le Moyne
University of Burgundy, France

S8-5 Online State of Charge and Electrical Impedance Estimation for Multicell Lithium-Ion Batteries
Taesic Kim, Wei Qiao and Liyan Qu
University of Nebraska-Lincoln, USA

Coffee Break
10:10 AM – 10:40 AM

Technical Session 9: Transportation- II
Session Chairs:
Michael Runyon, Manager – Chrysler Group LLC
Sheldon Williamson – Concordia University

Wednesday, June 19, 2013
10:40 AM – 12:00 PM
Venue: Stearns Knight

S9-1 Component Improvements in the Electrification of Passenger Vehicles Drivetrains
Thomas Devloo, Niels Leemput, Juan Van Roy, Frederik Geth, and Johan Driesen
University of Leuven (KU Leuven), Belgium

S9-2 A New Parallel-Series Configuration for Hybridization of a Line-Haul Truck
Fereydoon Diba and Ebrahim Esmailzadeh
University of Ontario Institute of Technology, Canada

S9-3 Frequency Demodulation-Aided Condition Monitoring for Drivetrain Gearboxes
Dingguo Lu and Wei Qiao
University of Nebraska-Lincoln, USA

S9-4 Plug-In Vehicle to Home (V2H) Duration and Power Output Capability
David Tuttle, Robert Fares, Michael Webber and Ross Baldick