Séminaire du chapitre Français
de IEEE "Vehicular Technology Society"

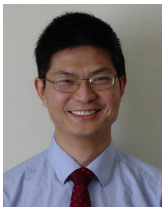
Lundi 11 mai 2009
14h30 - 16h,
salle des thèses,
Université de Lille 1, Sciences et Technologies de Lille,
59 655 Villeneuve d'Ascq (Métro ligne 1, arrêt Cité Scientifique)

Improving the Life, Safety and Capacity of Lithium-ion Batteries in Plug-in Hybrid Electric Vehicles

Prof. Chris MI,
Associate Professor, University of Michigan-Dearborn, USA

Abstract:
Lithium-ion batteries are considered as the only viable energy storage solution for the large deployment of plug-in hybrid electric vehicles (PHEV). The main issues of lithium-ion batteries include capacity fade, cycle life, and safety. The safety and longevity issues are significantly magnified in large battery systems used in PHEV and renewable energy systems. Much of the work at the present time is focused on battery chemistry and manufacturing process improvement. However, these issues can be effectively addressed from the control and management perspective, with a power electronics based solution. This presentation discusses the management of lithium-ion battery systems aimed at improving battery life, available capacity, battery safety and reliability in PHEV with power electronics based solutions.
The power electronics based solutions use isolated charge architecture to provide effective and safe cell-balancing during charge with reduced charging time, and a dynamic balance circuit during discharge to utilize all the cell energy available. Every cell tightly balances during charge and discharge in any combination of rows, modules, arrays, or strings of batteries. An effective thermal design and management are included to extend battery life, along with health monitoring, fault detection and fault isolation. Additional features of the system include conditioning vehicle system with a bidirectional converter for cold weather performance improvement. A number of fundamental issues were identified in the research, including dual phase-shift control algorithm, model based predictive control that combines online load parameter identification and dead-band compensation, and a framework for the research of short timescale transients in high power converters

About the Speaker



Dr. Chris. Mi is Associate Professor of Electrical and Computer Engineering and Director of DTE Power Electronics Laboratory at the University of Michigan-Dearborn, Michigan, USA. He is a leader expert in plug-in HEV and battery management. His research interests also inlcudes power electronics, electric machines, and their applications in hybrid electric vehicles and renewable energy systems. Dr. Mi is a leading expert in hybrid and plug-in hybrid electric vehicles. He has taught tutorials and led seminars on the subject of HEV/PHEV for the Society of Automotive Engineers (SAE) the IEEE, National Society of Professional Engineers (NSPE), and NSF funded workshops. He delivered the HEV course to major automotive OEMs and suppliers, including GM, Ford, Chrysler, A&T Technology, GE, and Delphi. He has offered the tutorial in five countries, including the US, China, Korea, Singapore, and Mexico. He has published more than 90 referred articles and delivered 30 invited talks and keynote speeches, and served as panelists
Dr. Mi holds a BS and an MS degree from Northwestern Polytechnical University, Xi'an, China, and a Ph.D degree from the University of Toronto, Canada. Dr. Mi worked with General Electric Company from 2000 to 2001.
More info: http://www-personal.engin.umd.umich.edu/~chrismi/ email: mi3032@gmail.com