# Sunday, October 10

**Environmental Issues**

**Session Code:** BC100  
**Room Phoenix A**  
**Organizers:** Stephen Brown, Samarium LLC; Paul G. Sanders, Michigan Technological University  
**Time** | **Paper No.** | **Title**  
--- | --- | ---  
3:00 p.m. | ORAL ONLY | Opening Remarks  
P. G. Sanders, Michigan Technological University  
3:20 p.m. | ORAL ONLY | On Airborne Nano/Micro-Sized Wear Particles Released from Semi-Metallic Automotive Brakes  
Peter Filip, Southern Illinois Univ. at Carbondale  
3:40 p.m. | ORAL ONLY | Status of Copper Legislation  
Robert Peters, Akebono Corp.  
4:00 p.m. | ORAL ONLY | Update on Brake Lining Composition Measurement Techniques  
Gregory M. Vyletel, ArvinMeritor  
4:20 p.m. | 2010-01-1670 | Technology Development of Laser Marking to Improve the Traceability of Brake Friction Materials (Written Only -- No Oral Presentation)  
Bruno Gellert, Welle Tecnologia Laser; Rafael Bottós, Gabriel Bottós, Welle Laser; Walter Weingaertner, UFSC  
4:40 p.m. | ORAL ONLY | Chemical Risk Assessment Process  
Patricia J. Beattie, Arcalis Scientific, LLC/SciVera. Inc.

# Monday, October 11

**Friction Materials**

**Session Code:** BC101  
**Room Phoenix A**  
**Organizers:** Peter Filip, Southern Illinois Univ. at Carbondale; Georg P. Ostermeyer, Technical Univ. of Braunschweig  
**Chairpersons:** Peter Filip, Southern Illinois Univ. at Carbondale; Georg Peter Ostermeyer, Univ. Of Braunschweig  
**Time** | **Paper No.** | **Title**  
--- | --- | ---  
1:30 p.m. | 2010-01-1676 | Use of Hexagonal Boron Nitride in Automotive Friction Materials  
Poh Wah Lee, Southern Illinois Univ. at Carbondale; Jon Leist, Momentive Performance Materials; Peter Filip, Southern Illinois Univ. at Carbondale  
1:50 p.m. | 2010-01-1672 | Magnetite Generated by Tribo-Reactions on the Surface of Brake Pad Material  
Ruth Hinrichs, Marcos Vasconcellos, UFRGS; Marcos Roberto Soares, Frasle SA
Welcome and Aftermarket Panel Session

Session Code:  BC500
Room Phoenix AB  Session Time:  8:00 a.m.

Moderators -  William P. Hilbrandt, Senior Vice President, Akebono Corp.
Panelists -  Roy Eastham, Director for Global IAM Engrg, Honeywell Friction Materials; David Gonzales, VP, Product Development, Genuine Parts Co, Rayloc Division; Robert Lee, President & CEO, OE Quality Friction Inc.; Roman Rotter, Technical & Quality Director, TRW Aftermarket; Chris Watson, Vice President International, MAT Holdings;

Monday, October 11

Technical Program Introduction

Session Code:  BC502
Room Phoenix AB  Session Time:  10:40 a.m.

Presenters -  Seong Kwan Rhee (Technical Program Chair), Hyundai MOBIS

Monday, October 11
Standards Information Update

Session Code:      BC501

Room Phoenix AB      Session Time:   10:45 a.m.

What new brake standards and practices are under development? What are the key brake issues being addressed by industry groups? Come and learn about SAE, ISO and Working Group Committees and Task Forces updates. Presented by Harald Abendroth (ISO), Steve Brown (SAE), and Florian Guckeisen, Audi (European Working Groups).

Organizers - Stephen Brown, Samarium L.L.C.

Monday, October 11

Braking for Electrics and Hybrids

Session Code:      BC107

Room Phoenix B      Session Time:   1:30 p.m.

Organizers - James W. Fash, Federal Mogul; Antoine Nehme, Peugeot Citroen Automobiles SA

Chairpersons - James Fash, Federal-Mogul Corp.; Antoine Nehme, Peugeot Citroen Automobiles SA

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<tr>
<th>Time</th>
<th>Paper No.</th>
<th>Title</th>
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<tbody>
<tr>
<td>1:30 p.m.</td>
<td>2010-01-1708</td>
<td>Brake By Wire System Configuration and Functions using Front EWB (Electric Wedge Brake) and Rear EMB (Electro-Mechanical Brake) Actuators</td>
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<td>Jae Seung Cheon, MOBIS</td>
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<td>1:50 p.m.</td>
<td>2010-01-1682</td>
<td>VE Mechatronic Brake: Development and Investigations of a Simple Electro Mechanical Brake</td>
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<td>Michael Herbert Putz, VE Vienna Engineering GmbH</td>
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<tr>
<td>2:10 p.m.</td>
<td>2010-01-1680</td>
<td>Braking System for a Full Electric Vehicle with Regenerative Braking</td>
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<td>Joseph Hartley, Tata Motors / Bradford University; Andrew Day, Ioan Campean, Bradford University; Rod G McLellan, Brake Testing International Ltd; John Richmond, Tata Motors European Technical Centre</td>
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<tr>
<td>2:30 p.m.</td>
<td>2010-01-1681</td>
<td>Effect of Regenerative Braking on Foundation Brake Performance</td>
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<td>David B. Antanaitis, General Motors</td>
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<td>2:50 p.m.</td>
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<td>BREAK</td>
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<td>3:10 p.m.</td>
<td>Panel</td>
<td>Panel Discussion</td>
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<td>Panelists - Paul E. Smith, Chrysler Group LLC; Charles K. Evans, Ford Motor Co.; David B. Antanaitis, General Motors LLC; Antoine Nehme, Peugeot Citroen Automobiles SA; Jae Seung Cheon, MOBIS;</td>
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<td></td>
<td>2010-01-1683</td>
<td>Improvements of Vehicle Fuel Economy Using Mechanical Regenerative Braking (Written Only -- No Oral Presentation)</td>
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<td>Alberto Boretti, University of Ballarat</td>
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Monday, October 11

Chassis Engineering, Brakes, Wheels, Tires and Shift Systems

Session Code:      BC107-2
This session addresses brake laboratory testing procedures, techniques, and methods. The papers presented include investigations on dynamometer testing variability; new methods for compressibility measurement for NVH, pedal feel, and quality control; non-destructive tests; and universal test data exchange formats. The session also includes a panel discussion regarding testing variability, vehicle-to-lab correlation, and lessons-learned to improve the value and robustness of laboratory testing.

Organizers - Carlos Agudelo, Link Testing Laboratories Inc.; Richard A. Kaatz, General Motors LLC


Product Repeatability and Variability During Inertia-Dynamometer Testing for Performance, Noise and Durability
Stephen Howard Bell, ABS Friction Inc.; Edward Peltz, Link Testing Laboratories Inc

Brake Dynamometer Test Variability - Analysis of Root Causes
Jaroslaw Grochowicz, Ford Motor Co.; Karl-Heinz Wollenweber, TRW Automotive; Carlos Agudelo, Link Engineering Co.; Harald Abendroth, Consultant

Development of Universal Brake Test Data Exchange Format and Evaluation Standard
Andreas Bender, STAC Elektronische Systeme GmbH; Karl Haesler, Daimler AG; Claus Thomas, Porsche AG; Jaroslaw Grochowicz, Ford Motor Company

Q&A
with presenters

Panelists - Carlos Agudelo, Link Testing Laboratories Inc.; Paul E. Smith, Chrysler Group LLC;
This session addresses brake laboratory testing procedures, techniques, and methods. The papers presented include investigations on dynamometer testing variability; new methods for compressibility measurement for NVH, pedal feel, and quality control; non-destructive tests; and universal test data exchange formats. The session also includes a panel discussion regarding testing variability, vehicle-to-lab correlation, and lessons-learned to improve the value and robustness of laboratory testing.

### Organizers
Carlos Agudelo, Link Testing Laboratories Inc.; Richard A. Kaatz, General Motors LLC

### Time | Paper No. | Title |
---|---|---|
1:30 p.m. | 2010-01-1699 | Automated Resonant Inspection to Validate Resonant Frequency Characteristics within Brake Components for Improved NVH Performance  
Richard W. Bono, Gail Stultz, Modal Shop Inc. |
1:50 p.m. | 2010-01-1700 | Effect of Brake Insulator Bond State on Damping Performance  
Christopher Thomas Griffen, Wolverine Advanced Materials |
2:10 p.m. | 2010-01-1701 | Comparative Studies of Non-destructive Methods for As-manufactured Brake Pads  
Donald E. Yuhas, Industrial Measurement Systems Inc.; Earl Gesch, Performance Friction; Takeshi Yamane, Nisshinbo Automotive Corp; Carol Vorres, Jacek Remiasz, Industrial Measurement Systems Inc |
2:30 p.m. | ORAL ONLY | Q&A  
with presenters |
2:50 p.m. | | BREAK |
3:10 p.m. | ORAL ONLY | Extension of Compressibility Measurements Beyond the Method-Specification for Quality Assurance Tests  
Christof Gente, Andreas Giese, Honeywell Bremsbelag GmbH |
3:30 p.m. | ORAL ONLY | Factors Influencing Brake Pad Compressibility Measurements  
James W. Fash, Federal Mogul |
3:50 p.m. | ORAL ONLY | Another Look of Brake Pads Compressibility Measurement  
HT Chang, TRW Automotive; Richard Kaatz, General Motors LLC; Charles Evans, Ford Motor Co |
4:10 p.m. | ORAL ONLY | Q&A  
with presenters |

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### NVH (Part 1)

### Session Code: BC104  
### Room Phoenix B  
### Session Time: 8:00 a.m.

This session focuses on brake noise and vibration issues. The scope of coverage includes measurements, analysis, modeling, testing, and fundamental mechanisms. The papers to be presented will cover noise and vibration issues ranging from low frequency judder to the highest frequency squeals. This should be an outstanding session for those new to brake NVH or those wishing to see the latest in technical activities.

### Organizers
James K. Thompson, JKT Enterprises; Hidetoshi Shimizu, Link Engineering; Eric Denys, MSC Material Sciences Corp.

### Chairpersons
Eric Denys, MSC Material Sciences Corp.; Hidetoshi Shimizu, Link Engineering Co.

### Time | Paper No. | Title |
---|---|---|

### NVH (Part 2)

**Session Code:** BC104  
**Room Phoenix B**  
**Session Time:** 1:30 p.m.

This session focuses on brake noise and vibration issues. The scope of coverage includes measurements, analysis, modeling, testing, and fundamental mechanisms. The papers to be presented will cover noise and vibration issues ranging from low frequency judder to the highest frequency squeals. This should be an outstanding session for those new to brake NVH or those wishing to see the latest in technical activities.

**Organizers:** James K. Thompson, JKT Enterprises; Hidetoshi Shimizu, Link Engineering; Eric Denys, MSC Material Sciences Corp.

**Chairpersons:** Eric Denys, MSC Material Sciences Corp.; Hidetoshi Shimizu, Link Engineering Co.

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<tr>
<th>Time</th>
<th>Paper No.</th>
<th>Title</th>
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| 1:30 p.m.  | 2010-01-1688| **Brake Rotor Modal Frequencies: Measurement and Control**  
Mohamed Khalid Abdelhamid, Robert Bosch LLC; Eric Denys, Material Sciences Corporation |
| 1:50 p.m.  | 2010-01-1693| **Effect of Dimensions on Vibration-Damping Capacity of a Brake Disc**  
Toshikazu Okamura, Hiroyuki Yumoto, KIRIU Corp. |
2:10 p.m. 2010-01-1692 On the Relation between Rotor Asymmetry and Brake Squeal
Gottfried Spelsberg-Korspeter, Martin Schönecker, Peter Hagedorn, TU Darmstadt

2:30 p.m. 2010-01-1694 Study of the Relationship between DTV, BTV and BPV over Judder-Type Vibration of Disc Brake Systems
Francisco Bisotto Jardim, Fras-Le SA; Alberto Tamagna, Federal University of Rio Grande do Sul

2:50 p.m. BREAK

3:10 p.m. 2010-01-1690 An Experimental Investigation of Brake Rotor DTV Under Laboratory Conditions - Part 3
Alan Backstrom, Romteck

3:30 p.m. ORAL ONLY Formulation of a Coupled Mechanical and Hydraulic Multi-physics Model of the Disc-Caliper Brake System
Rajendra Singh, Ohio State Univ.; Stephen Ebert, Honda R&D Americas, Inc.; Jason Dreyer, Jared Liette, Ohio State Univ.; Bill Post, Honda R&D Americas, Inc.; Taha Sen, Ohio State Univ.

Wednesday, October 13

Brake Technology
Session Code: BC106
Room Phoenix A
Session Time: 8:00 a.m.

Organizers - James W. Fash, Federal Mogul; Antoine Nehme, Peugeot Citroen Automobiles SA
Chairpersons - Antoine Nehme, Peugeot Citroen Automobiles SA; James Fash, Federal-Mogul Corp.

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<th>Time</th>
<th>Paper No.</th>
<th>Title</th>
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<tr>
<td>8:00 a.m.</td>
<td>2010-01-1703</td>
<td>Liquid Cooled Driveline Braking System Technology and Test Results</td>
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<td>Russell Creed, Andrew Creed, John P. Deconti, D-Brake LLC</td>
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<td>8:20 a.m.</td>
<td>2010-01-1707</td>
<td>Novel Design of the Integrated Electric Parking Brake System (Written Only -- No Oral Presentation)</td>
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<td>Yan-Sin Liao, Chien-Tai Huang, Chien-Tzu Chen, Shou-Yi Cheng, Bo-Ruei Chen, Fu-Yen Huang, Automotive Research &amp; Testing Center</td>
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<td>8:40 a.m.</td>
<td>2010-01-1704</td>
<td>New Joining Methods for Composite Brake Disks</td>
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<td>Florian Fuellgrabe, Hermann Winner, Technische Universitaet Darmstadt; Ingo Hoffmann, SHW Automotive</td>
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<tr>
<td>9:00 a.m.</td>
<td>2010-01-1705</td>
<td>Development and Testing of Lightweight Aluminum Composite Brake for Medium to Heavy Duty Vehicles</td>
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<td>Matt Kero, Andrew Halonen, Century Inc.</td>
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<td>9:20 a.m.</td>
<td>2010-01-1706</td>
<td>Development of Low Friction and Light Weight Wheel Hub Units to Reduce both the Brake Corner Unsprung Mass and Vehicle CO2 Emission (Part 1-Friction)</td>
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<td>Cengiz R. Shevket, SKF Automotive Dev; Luca Ciulla, Paolo Re, SKF Industrie S.p.A</td>
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<td>9:40 a.m.</td>
<td>BREAK</td>
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Wednesday, October 13

Modeling

Session Code: BC103
Room Phoenix B
Session Time: 8:00 a.m.
Organizers - Theo Kaster, TRW Automotive; Kwangjin M. Lee, Delphi Corp.

Time | Paper No. | Title |
--- | --- | --- |
8:00 a.m. | ORAL ONLY | Keynote - Brake Squeal: A Robustness Analysis Based on Dispersion and Evolution of System Properties
Ronaldo Nunes, Arnaud Heussaff, Daimler AG |
8:30 a.m. | 2010-01-1712 | Numerical and Experimental Parameter Studies on Brake Squeal
Daniel Wallner, Stefan Bernsteiner, Wolfgang Hirschberg, Graz University of Technology; Alexander Rabofsky, Magna Steyr Fahrzeugtechnik AG & CoKG |
8:50 a.m. | 2010-01-1711 | New Method to Identify Dynamic Normal Stiffness and Damping of Shims for CAE Modeling
John Flint, TRW Automotive; Aneesh Chinnasamy, University of Stuttgart; Alwin Stikvoort, Trelleborg Rubore AB |
9:10 a.m. | ORAL ONLY | Comprehensive Modeling of Brake System Components in the Presence of Epistemic Uncertainties
Michael F. Hanss, Univ. Of Stuttgart |
2010-01-1713 | Prediction of Thermal Conditions for Multidisc Oil-Cooled Brake of a Mining Truck (Written Only -- No Oral Presentation)
Vladimir Sergienko, Mikhail Tseluev, Sergey Bukharov, National Academy of Sciences of Belarus |

Wednesday, October 13

Friction-Induced Vibration and Effects of Vibration on Friction (Part 1)

Session Code: BC102
Room Phoenix B
Session Time: 10:00 a.m.
Organizers - Harald Abendroth, Consultant; Li Lee, Akebono Engineering Center

Time | Paper No. | Title |
--- | --- | --- |
10:00 a.m. | 2010-01-1715 | Modification of Strain Distribution on Contact Surface of Shoe to Reduce Low Frequency Squeals for Brake Disc with Small Holes
Kiyotaka Obunai, Sho Hagiwara, Kazuya Okubo, Toru Fujii, Doshisha Univ.; Tsuyoshi Nakatsuiji, Sunstar Engineering |
10:20 a.m. | 2010-01-1716 | Considering the Dynamic Pad Stiffness in FEM Analysis of Disk Brake Squeal
Hiroyuki Nonaka, Yukio Nishizawa, ADVICS Co., Ltd.; Yutaka Kurita, Yasunori Oura, Univ of Shiga Prefecture |
10:40 a.m. | ORAL ONLY | Non-Linear Signal Analysis of Friction Induced Vibrations
Boris A. Wernitz, Honeywell Bremsbelag GmbH |
11:00 a.m.  ORAL ONLY  New Fundamental Challenge for Brake Squeal Reduction - Dynamic Instability System and Disturbance
Masaaki Nishiwaki, Teikyo University

Wednesday, October 13

Friction-Induced Vibration and Effects of Vibration on Friction (Part 2)
Session Code:  BC102
Room Phoenix B  Session Time:  12:30 p.m.

Organizers -  Harald Abendroth, Consultant; Li Lee, Akebono Engineering Center

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<th>Time</th>
<th>Paper No.</th>
<th>Title</th>
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<tr>
<td>12:30 p.m.</td>
<td>2010-01-1717</td>
<td>Dynamic Friction Laws and Their Impact on Friction Induced Vibrations</td>
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<td>Georg Ostermeyer, Technische Universität Braunschweig</td>
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<tr>
<td>1:00 p.m.</td>
<td>Panel</td>
<td>Panel Discussion: Friction Excitation and Squeal Triggering Mechanisms</td>
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This panel discussion will cover topics on friction excitation and squeal triggering mechanisms. Established theories which might need to be extended or modified as well as new potential mechanisms will be in focus. Opportunities and needs to integrate new features into NVH computer models will be addressed. Better understanding of empirical data and excitation manipulations may help in understanding the effect of dynamic friction material properties, noise shims, stationary and travelling brake rotor waves etc.

Panelists - Michael F. Hanss, Univ. of Stuttgart; John Flint, TRW Automotive; Rajendra Singh, Ohio State Univ.; Li Lee, Akebono Engineering Center; Masaaki Nishiwaki, Teikyo University; Georg Peter Ostermeyer, Technische Universität Braunschweig; Boris A. Wernitz, Honeywell Bremsbelag GmbH;