MECHANOMADE®
Mechanomade® FA25 is a metal powder manufactured by means of a mechano-chemical process known as High Energy Ball Milling (HEBM). The result of this process is the creation of specifically functionalized products with unique properties where the integration and homogeneous distribution of the phases result in superior performance.

- Good thermal conductivity due to metallic nature and particular flake morphology
- Constant friction even at high load, low fade and good recovery
- Low disc wear contributing to the formation of a constant and uniform third layer
- Good corrosion resistance

SICACELL
Improves the physical and tribological characteristics of brake pads

STILOX
The right key to improves the friction level reducing wear and noise

ULTIMATE SERIES
New approaches to lubrication in friction material free of antimony trisulphide: from alternative compounds to adaptive lubricants

PROCHIM GP
A noise process solution in friction material

PROCHIM D SERIES
The most cheaper alternative of abrasive modifier

ALOX SERIES
Calcined aluminium oxides with different particle size and a-Al₂O₃ content

POTASSIUM TITANATE
Functional filler available in several morphologies
## CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sponsors</td>
<td>2</td>
</tr>
<tr>
<td>Hotel Floorplan</td>
<td>4</td>
</tr>
<tr>
<td>Event-At-A-Glance</td>
<td>6</td>
</tr>
<tr>
<td>General Information</td>
<td>7</td>
</tr>
<tr>
<td>Opening Keynote &amp; Awards</td>
<td>8</td>
</tr>
<tr>
<td>Exhibitor New Product Showcase</td>
<td>10</td>
</tr>
<tr>
<td>Professional Development</td>
<td>11</td>
</tr>
<tr>
<td>Technical Sessions</td>
<td>13</td>
</tr>
<tr>
<td>Participants Index</td>
<td>27</td>
</tr>
<tr>
<td>Call for Papers</td>
<td>28</td>
</tr>
<tr>
<td>Exhibitor Directory</td>
<td>29</td>
</tr>
<tr>
<td>Ad Index</td>
<td>40</td>
</tr>
</tbody>
</table>

### EMERGENCY PROCEDURES DURING THE BRAKE COLLOQUIUM

During the event attendees are to follow the established emergency guidelines of the facility where the emergency occurs. Based on the location of the incident, report emergencies to the nearest venue representative and/or security personnel if available, or report to the SAE registration area.

Should a catastrophic event occur, attendees should follow the safety and security instructions issued by the facility at the time of the event. This includes listening for instructions provided through the public address system and following posted evacuation routes if required.

In the event of an emergency or a major disruption to the schedule of events at the event, attendees and exhibitors may call this number to receive further information about the resumption of this event. Updates will also be provided via the SAE website at www.sae.org.

### SAE EMERGENCY HOTLINE

+1.724.772.4044  
+1.800.581.9295

Attendees are permitted to bring camera equipment onto the show floor. Exhibitors retain the right to restrict photography of their products or displays and such decisions are within the discretion of the exhibitor and are not controlled by SAE International.

### CONSENT TO USE OF IMAGES

Please note that photographs and video taken by or on behalf of SAE International of event activities and attendees shall be the property of SAE International. By registering for an SAE International event, you consent to the use by SAE International of any photograph or video in which you appear, including for promotional purposes, in print, digital, or other format, without notice or compensation to you.
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- Waupaca
- Wolverine Advanced Materials
HOTEL FLOOR PLAN

*Lower Level

JW Pavilion*

Springs Pool*

The Pointe*

San Jacinto Ballroom*

Director's Suites I-VII, A

Santa Rosa Ballroom*

AV

Tour Lobby

Business Center

TNT

HOTEL LOBBY

REGISTRATION

EXHIBIT HALL, NETWORKING BREAKS AND LUNCHES, EXHIBITOR NEW PRODUCT SHOWCASE

TECHNICAL SESSIONS

TUESDAY NETWORKING RECEPTION

Springs Ballroom

Desert Ballroom

South Foyer

G-L

A-F

North Foyer

Ballroom Entrance

Banquet Kitchen

Equipment Storage

4 Brake Colloquium & Exhibition
THEN

NOW

THE EVOLUTION OF GALVANIZED STEEL!

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VISIT US AT BOOTH 301

NRSBRAKES.COM
<table>
<thead>
<tr>
<th>October 14</th>
<th>October 15</th>
<th>October 16</th>
<th>October 17</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SUNDAY</strong></td>
<td><strong>MONDAY</strong></td>
<td><strong>TUESDAY</strong></td>
<td><strong>WEDNESDAY</strong></td>
</tr>
<tr>
<td>7 a.m. – 2:30 p.m.</td>
<td>8 – 9:30 a.m.</td>
<td>7:30 – 8 a.m.</td>
<td>7:30 – 8 a.m.</td>
</tr>
<tr>
<td>Golf Outing</td>
<td>Continental Breakfast</td>
<td>Networking Coffee Break</td>
<td>Networking Coffee Break</td>
</tr>
<tr>
<td>Valley Course at JW Marriott</td>
<td>Foyer</td>
<td>Foyer</td>
<td>Foyer</td>
</tr>
<tr>
<td>Desert Springs</td>
<td>8:30 – 9:40 a.m.</td>
<td>8 – 9:20 a.m.</td>
<td>8 – 9:40 a.m.</td>
</tr>
<tr>
<td>Welcome, Award Presentations, and Keynote</td>
<td>Technical Sessions</td>
<td>Technical Sessions</td>
<td>Technical Sessions</td>
</tr>
<tr>
<td>Keynote: Kelly Funkhouser, Consumer Reports</td>
<td>Sponsored by: NUCAP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 – 6 p.m.</td>
<td>9:40 – 10:20 a.m.</td>
<td>9:40 – 10 a.m.</td>
<td>9:40 – 10 a.m.</td>
</tr>
<tr>
<td>Technical Sessions</td>
<td>Networking Break</td>
<td>Networking Break</td>
<td>Networking Break</td>
</tr>
<tr>
<td></td>
<td>Exhibit Hall</td>
<td>Exhibit Hall</td>
<td>Exhibit Hall</td>
</tr>
<tr>
<td>3 – 4:20 p.m.</td>
<td>10:20 – 11:40 a.m.</td>
<td>10 – 11:40 a.m.</td>
<td>10 – 11:40 a.m.</td>
</tr>
<tr>
<td>Introduction to Advanced Driver-Assistance Systems (ADAS)</td>
<td>Technical Sessions</td>
<td>Technical Sessions</td>
<td>Technical Sessions</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>4:20 – 4:40 p.m.</td>
<td>11:40 a.m. – 1 p.m.</td>
<td>11:40 a.m. – 1 p.m.</td>
<td>11:40 a.m. – 12:40 p.m.</td>
</tr>
<tr>
<td>Networking Break</td>
<td>Networking Lunch</td>
<td>Networking Lunch</td>
<td>Networking Lunch</td>
</tr>
<tr>
<td>Foyer</td>
<td>Exhibit Hall</td>
<td>Exhibit Hall</td>
<td>Foyer</td>
</tr>
<tr>
<td>4:40 – 6 p.m.</td>
<td>1 – 3 p.m.</td>
<td>12:40 – 3:15 p.m.</td>
<td>3:15 p.m.</td>
</tr>
<tr>
<td>Introduction to Electric Vehicles Tutorial</td>
<td>Technical Sessions</td>
<td>Technical Sessions</td>
<td>Conclusion</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TECHNICAL SESSION</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>NETWORKING OPPORTUNITY</strong></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

**EVENT-AT-A-GLANCE**

**SAE INTERNATIONAL**

**BRAKE COLLOQUIUM & EXHIBITION - 36TH ANNUAL**

October 14-17, 2018
EVENT INFORMATION

Registration
South Counter
Sunday, October 14
Noon–5 p.m.
Monday, October 15
7 a.m.–4 p.m.
Tuesday, October 16
7 a.m.–3:30 p.m.
Wednesday, October 17
7 a.m.–10 a.m.

Exhibit Hours
Desert Ballroom
Monday, October 15
9:30 a.m.–4 p.m.
Tuesday, October 16
9 a.m.–4 p.m.

Networking Reception
Springs Patio
Tuesday, October 16
5:30 p.m.–7 p.m.

Networking
Lunches
Dessert Ballroom
Monday, October 15
11:40 a.m.–1 p.m.
Tuesday, October 16
11:40 a.m.–1 p.m.
Wednesday, October 17
Springs Salon A-F Foyer
11:40 a.m.–12:40 p.m.

Networking Breaks
Dessert Ballroom
Monday, October 15
9:40 a.m.–10:20 a.m.
Monday, October 15
3 p.m.–3:40 p.m.
Tuesday, October 16
9:20–10 a.m.
Tuesday, October 16
3–3:40 p.m.
Wednesday, October 17
Springs Salon A-F Foyer
9:40–10 a.m.

Networking Breaks
Dessert Ballroom
Monday, October 15
9:40 a.m.–10:20 a.m.
Monday, October 15
3 p.m.–3:40 p.m.
Tuesday, October 16
9:20–10 a.m.
Tuesday, October 16
3–3:40 p.m.
Wednesday, October 17
Springs Salon A-F Foyer
9:40–10 a.m.

Wifi Information
SSID: Marriott_Conference
Password: Brake2018

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OPENING CEREMONY, AWARDS AND KEYNOTE
MONDAY OCTOBER 15

Salon A-F
8:30–9:40 a.m.

Welcome and Awards
Roy Link
Chairman and CEO
Link Engineering Company

Keynote Speaker: Braking Up is Never Easy - Consumer Acceptance of Advanced Braking Systems
Kelly Funkhouser
Consumer Reports

Kelly Funkhouser has spent the last 10 years studying human factors and usability of vehicle technology systems. She has worked on various projects for government and industry assessing driver distraction, cooperative driving, transfer of control, driver perceptions, and trust in automation. Ms. Funkhouser recently joined the Auto Test team at Consumer Reports as the Program Manager for Vehicle Usability and Automation. She assesses driver interactions with controls, infotainment systems, and all levels of automation. She believes the key to ensuring the safety benefits of new technologies is through a driver-centered design that propels consumer acceptance, trust, and correct use.
AWARDS PRESENTED AT THE BRAKE COLLOQUIUM

**ALLEN M. LANG AWARD**

Sponsored by TMD Friction

This award recognizes the “Best Presentation” given during the SAE Annual Break Colloquium & Exhibition events. This is a memorial to Allan Michael Lang. Mr. Lang was killed in an avalanche while hiking in Scotland. He was Research Manager at Mintex Don, Ltd., a BBA Group Company. His Ph.D. was in Mechanical Engineering from Loughborough University in England and his thesis was entitled “An Investigation into Heavy Vehicle Drum Breaks Squeal.”

2018 Recipient:
Sergio Metteo Savarese

*State of the Art and Perspective of Electronic Controls for Single-Track Vehicles*

---

**BEST NEW PRESENTER AWARD**

Sponsored by KB autosys

This award will be given to the best new presenter. To be considered, the recipient should have presented less than three presentations at the SAE Brake Colloquium.

2018 Recipient:
Michael Gromosiak

---

**BEST PAPER AWARD**

Sponsored by Compact Brakes

This award is given to the best paper from the SAE 2017 Brake Colloquium.

2018 Recipients:
*Brake System Performance at Higher Mileage (2017-01-2502)*

David Antanaitis

Matthew Robere

---

**SAE FOREST R. MCFARLAND AWARD**

This award recognizes individuals for their outstanding contributions toward the work of the SAE Engineering Meetings Board (EMB) in the planning, development, and dissemination of technical information through technical meetings, conferences, and professional development programs or outstanding contributions to the EMB operations in facilitating or enhancing the interchanges of technical information.

2018 Recipient:
Michael Schorn

---

**DAN MAHANNAH AWARD**

This award is a memorial to Dan Mahannah. The Dan Mahannah Achievement Award is presented to a distinguished Member of our industry. It recognizes an individual who makes unselfish contributions toward the betterment of the industry and its members; through technological advancements, educational or promotional endeavors.
EXHIBITOR NEW PRODUCT SHOWCASE AND TECHNOLOGY AREA
EXHIBIT HALL

The focus of this session is for exhibitors to discuss technology contained with their product and what pain point or problem does it solve for the customer. Each of the TED-like oral presentation will be 10 minutes in duration and presented during lunch or networking breaks on the exhibit floor.

### MONDAY, OCTOBER 15

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:25 - 12:35 p.m.</td>
<td>Unrivaled Innovation in Brake Component Surface Finishing</td>
</tr>
<tr>
<td></td>
<td>Björn O. Dingwerth, MacDermid Enthone Industrial Solutions</td>
</tr>
<tr>
<td>12:40 - 12:50 p.m.</td>
<td>Brake Development Using Scanning Laser Doppler Vibrometry</td>
</tr>
<tr>
<td></td>
<td>Eric Lawrence, Polytec Inc.</td>
</tr>
<tr>
<td>12:55 - 1:05 p.m.</td>
<td>How PureForge Atomic-Forged Brake Rotos are Changing How the World Brakes</td>
</tr>
<tr>
<td></td>
<td>Amy Dobrikova, Hadrian Rori, Vibration Inc.</td>
</tr>
<tr>
<td>3:10 - 3:20 p.m.</td>
<td>Corrosion Resistant Wheel Bearing Coating</td>
</tr>
<tr>
<td></td>
<td>Kelly T. Grubaugh, ILJIN USA Corporation</td>
</tr>
</tbody>
</table>

### TUESDAY, OCTOBER 16

<table>
<thead>
<tr>
<th>Time</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>9:30 - 9:40 a.m.</td>
<td>Superior Graphite Co Expansion</td>
</tr>
<tr>
<td></td>
<td>Eric Salmon, Superior Graphite</td>
</tr>
<tr>
<td>12:25 - 12:35 p.m.</td>
<td>Can Corroded Pad Back-Plates Lead to Safety Issues while Braking in a Vehicle</td>
</tr>
<tr>
<td></td>
<td>Parimal B. Mody, NUCAP Industries Inc.</td>
</tr>
<tr>
<td>12:40 - 12:50 p.m.</td>
<td>What’s In Your Brake Dust?</td>
</tr>
<tr>
<td></td>
<td>Jessica Celentano, Bruker Corporation</td>
</tr>
<tr>
<td>12:55 - 1:05 p.m.</td>
<td>Comprehensive Engineering Services for Brake System Development</td>
</tr>
<tr>
<td></td>
<td>Bernat Ferrer, IDIADA</td>
</tr>
</tbody>
</table>

**Entrance**
ADAS Application: Automatic Emergency Braking Course ID C1704
Instructor: Eldon Leaphart
October 17, 2018 | 8:30 a.m. - 4:30 p.m.
Active Safety, Advanced Driver Assistance Systems (ADAS) are now being introduced to the marketplace as they serve as key enablers for anticipated autonomous driving systems. Automatic Emergency Braking (AEB) is one ADAS application which is either in the marketplace presently or under development as nearly all automakers have pledged to offer this technology by the year 2022. This one-day course is designed to provide an overview of the typical ADAS AEB system from multiple perspectives. A technical overview of the development cycle processes specific to AEB, including system level requirements and design architecture will be presented as well as design considerations for AEB from a functional safety (ISO-26262) perspective. A general overview of algorithm concepts for the various AEB subsystems will be demonstrated followed by a review of AEB system test and validation methods. Finally, discussion is facilitated toward understanding customer perception and acceptance of AEB at present. The participant should obtain a fundamental understanding of design principles and functional composition for a typical AEB system.
REGISTER AT:
sae.org/learn/content/c1704/

Brake Friction Materials: Testing, Quality and Selection Course ID C1020
Instructor: Mohammad Vakili
October 18, 2018 | 8:30 a.m. - 4:30 p.m.
The choice of brake friction materials varies per application, but each must have the appropriate coefficient of friction and be able to disperse large amounts of heat without adversely effecting braking performance. This seminar will provide an introduction to brake lining raw materials and formulation, manufacturing, quality control and testing. The course covers the critical elements that must be reviewed before arriving at a lining selection decision. Different classes of friction material and their use will be defined.
REGISTER AT:
sae.org/learn/content/c1020/

Introduction to Brake Noise, Vibration, and Harshness Course ID C1337
Instructor: Eric Denys
October 18, 2018 | 8:30 a.m. - 4:30 p.m.
Brake Noise, Vibration, and Harshness (NVH) is recognized as one of the major problems currently faced by the automotive manufacturers and their suppliers, with customers warranty claims of more than $100 million per year for each manufacturer. With increasing consumer braking performance expectations and the high cost of warranty repairs are pushing the optimization of brake NVH performance. This course will provide you with an overview of the various damping mechanisms and tools for analyzing and reducing brake noise. A significant component of this course is the inclusion of case studies which will demonstrate how brake noise squeal issues have been successfully resolved.
REGISTER AT:
sae.org/learn/content/c0831/

Brake Noise Problem Resolution Course ID C0831
Instructor: Eric Denys
October 19, 2018 | 8:30 a.m. - 4:30 p.m.
Brake noise is one of the highest ranked complaints of car owners. Grunts, groans, squeaks, and squeals are common descriptions of the annoying problem which brake engineers spend many hours trying to resolve. Consumer expectations and the high cost of warranty repairs are pushing the optimization of brake NVH performance. This course will provide you with an overview of the various damping mechanisms and tools for analyzing and reducing brake noise. A significant component of this course is the inclusion of case studies which will demonstrate how brake noise squeal issues have been successfully resolved.
REGISTER AT:
sae.org/learn/content/c0831/

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Vehicle Integration
FCA US LLC
**TECH SESSIONS WEEK AT A GLANCE**

<table>
<thead>
<tr>
<th>Room No.</th>
<th>Page No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salon A-F</td>
<td>17</td>
</tr>
<tr>
<td>Salon G-L</td>
<td>19, 20, 22</td>
</tr>
<tr>
<td>Salon A-F</td>
<td>19</td>
</tr>
<tr>
<td>Salon G-L</td>
<td>23</td>
</tr>
<tr>
<td>Salon A-F</td>
<td>18</td>
</tr>
<tr>
<td>Salon G-L</td>
<td>20</td>
</tr>
<tr>
<td>Salon G-L</td>
<td>23</td>
</tr>
<tr>
<td>Salon G-L</td>
<td>21, 22</td>
</tr>
<tr>
<td>Salon A-F</td>
<td>17</td>
</tr>
<tr>
<td>Salon G-L</td>
<td>24</td>
</tr>
<tr>
<td>Salon A-F</td>
<td>25</td>
</tr>
<tr>
<td>Salon A-F</td>
<td>24</td>
</tr>
<tr>
<td>Salon G-L</td>
<td>25</td>
</tr>
<tr>
<td>Salon A-F</td>
<td>14</td>
</tr>
<tr>
<td>Salon A-F</td>
<td>14</td>
</tr>
<tr>
<td>Salon A-F</td>
<td>16</td>
</tr>
<tr>
<td>Salon A-F</td>
<td>16</td>
</tr>
<tr>
<td>Salon G-L</td>
<td>15</td>
</tr>
</tbody>
</table>

**SAE Brake Colloquium & Exhibition - 37th Annual**
September 22-25, 2019
Orlando, Florida, USA

**SAE Brake Colloquium & Exhibition - 38th Annual**
October 11-14, 2020
San Antonio, Texas, USA

**SAE Brake Colloquium & Exhibition - 39th Annual**
October 17-20, 2021
Orlando, Florida, USA
NEW TO THE BRAKE COLLOQUIUM – TUTORIALS

Sunday, October 14

TUTORIAL: AN INTRODUCTION TO ADVANCED DRIVER-ASSISTANCE SYSTEMS (ADAS)
Salon A-F
3 – 4:20 p.m.

The move toward more systems to assist drivers as we transition to fully automated vehicle has an impact on the development of brake systems. In order to create the brake systems of the future, this tutorial is designed to share an introductory look at the fundamental on Advanced driver-assistance systems (ADAS). For a 1-day course on ADAS Systems please review at sae.org/learn/content/c1704/.

- Vehicle System structure (Cameras, Radars, ADAS, ESP, (E-Booster), Caliper, Rotor)
- Market trend (Autonomous Driving, Front/Rear AEB adoption rate, AEB faster TTL for NCAP, EPB adoption, Cu Free pad adoption)
- Other ADAS Functions (LDP, ICC, FCW, BSW, BSI, RCT, BCI etc.)
- Chassis control by brake application (IDM, Trailer sway control)
- Requirements to brake system

Speaker
Zachary S. Tullock
Nissan Technical Center NA

TUTORIAL: AN INTRODUCTION TO ELECTRIC VEHICLES
Salon A-F
4:40 – 6 p.m.

The move toward Electric Propulsion Systems has an impact on the development of brake systems. In order to create the brake systems of the future, this tutorial is designed to share an introductory look at the fundamental on electric vehicles. For a 3-day course on Hybrid and Electric Vehicle Systems please review at sae.org/learn/content/c1504/.

- Brake sizing for regen-intensive vehicles
- The very close corollary “failure modes for regen braking”
- Brake sizing and failure modes for the friction couple
- Different types of e powertrain
- Regeneration energy (expected) per type of powertrain
- Customer preferences and available settings on board (coast regen)
- Real world testing and special situations when brake interventions have an influence of the epowertrain controls

Speaker
Jerome Gregeois
Hyundai-Kia America Technical Center Inc
# TECH SESSIONS

**SUNDAY, OCTOBER 14 - AFTERNOON**

**Technical and Business Sessions**

<table>
<thead>
<tr>
<th>TIME</th>
<th>SESSION TITLE, DESCRIPTION, AND ROOM</th>
</tr>
</thead>
</table>
| Salon G-L | Wheel Bearings Technical Presentations (BC120)  
This session will focus on innovations in wheel bearings and their integration to the vehicle. Individuals will address topics such as mass optimization, drag reduction, enterprise cost, warranty reduction, Brinelling, sealing, corner splash protection, lateral stiffness, lubrication, validation, coatings and new technology. Additionally it is a great place to meet people in the wheel bearing industry and have an open dialog about the multiple challenges facing our industry.  
3:00 p.m. - 6:00 p.m.  
Organizers: Kelly T. Grubaugh, Richard Haehn, ILJIN USA Corporation; Robert G. Sutherlin, General Motors LLC |
| 3:00 p.m. | Keynote: Customer requirements, vehicle testing and bench testing for wheel bearings  
(Oral Only)  
Robert G. Sutherlin, General Motors LLC |
| 3:40 p.m. | Design Considerations of Integrating Conventional Wheel End Bearings with e-Axles  
(Oral Only)  
Erik Lesco, The Timken Company |
| 4:00 p.m. | Effects of the Metal Surface Profile to the Sliding Properties Between Rubber and Metal and Applying That to Wheel Bearing Seals  
(2018-01-1904)  
Koki Ishida, Uchiyama Mfg Corp.; Masahiro Fuji, Okayama Univ.; Jun Hwi Cho, Kevin Pittel, Uchiyama Mktng & Devmt America LLC |
| 4:20 p.m. | Advancements in Wheel Bearing Designs for Greater Efficiencies  
(Oral Only)  
Jon Barrett, NTN Bearing Corp. of America |
| 4:40 p.m. | Bearing Life Evaluation for Automotive Wheel Bearings using Design of Experiments  
(2018-01-1903)  
Seungpyo Lee, Iljin Global |
| 5:00 p.m. | **WHEEL BEARINGS FRICITION PANEL DISCUSSION**  
Reduced CO2 emissions and increased fuel economy are increasing pressure to reduce wheel bearing friction or drag. At the same time, improving vehicle durability and improved ride and handling create conflicting requirements for bearings. This panel will discuss these design tradeoffs and potential bearing and sealing solutions to these challenges.  
Moderators: Richard Haehn, ILJIN USA Corporation  
Panelists: Alan Backstrom, Karma Automotive  
Kelly T. Grubaugh, ILJIN USA Corporation  
Michael Kottzas, The Timken Company  
Anuj Mistry, Fuchs Lubricants Co.  
Robert G. Sutherlin, General Motors |
Monday, October 15

OPENING KEYNOTE: BRAKING UP IS NEVER EASY—CONSUMER ACCEPTANCE OF ADVANCED BRAKING SYSTEMS
(Session Code: BCK1)
Room Salon A-F
8:30 a.m. - 9:40 a.m.

Keynote Speaker:
Kelly Funkhouser, Consumer Reports

VOICE OF THE OEM PANEL DISCUSSION
(Session Code: BC123)
Room Salon A-F
10:20 – 11:40 a.m.

A distinguished panel of brake engineering leaders from the OEM community will discuss brake related topics. Come prepared to ask your questions and make comments in what is meant to be a direct and open discussion between the OEMs and the brake industry.

Organizers:
Thomas J. Hall, MaxG Technology LLC; Richard A. Kaatz, KBAutosys Co. Ltd.

Moderator: Richard A. Kaatz, KBAutosys Co. Ltd.

Panelists:
Michael Lingg, Volkswagen Aktiengesellschaft
Bill Strickland, Evelozcity
James Webster, General Motors LLC
Mike Petrovski, Ford Motor Co.
Timm Redder, Chanje Energy, Inc.
SPECIAL KEYNOTE: AUTOMATED DRIVING AND IMPLICATION OF BRAKING
(Session Code: BCK2)
Room Salon A-F
1 - 1:40 p.m.

Keynote Speaker:
Manfred Meyer, ZF Active & Passive Safety Technology

ADVANCED DRIVER-ASSISTANCE SYSTEMS (ADAS) AND AUTOMATED EMERGENCY BRAKING PANEL DISCUSSION
(Session Code: BC126)
Room Salon A-F
1:40 – 3 p.m.

It is the objective of this panel discussion and exchange ideas on the potential for innovation in system configurations and integration (controls, actuation, powerplant, powertrain, foundation brakes). Topics include US NCAP, EuroNCAP, and ISO protocols and standards applicable to brakes; control systems, software, and smart sensors; ABS, Automated Cruise Control, Automated Parking Assist Systems; and impacts on foundation brake designs, friction materials, and new control technologies.

Organizers & Moderators:
Carlos Agudelo, Link Engineering Co.; David B. Antanaitis, General Motors LLC

Panelists:
Jaeseung Cheon, Hyundai Mobis
Chad Zagoski, General Motors LLC
Manfred Meyer, ZF TRW Active & Passive Safety Tech
Jeff Pontius, Mando America Corporation
Thomas J. Hall, MaxG Technology
### MONDAY, OCTOBER 15 - AFTERNOON
#### Technical and Business Sessions

<table>
<thead>
<tr>
<th>TIME</th>
<th>SESSION TITLE, DESCRIPTION, AND ROOM</th>
</tr>
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</table>
| 1:40 p.m. | **Friction/Raw Materials Technical Presentations: (Part 1) (BC100)**  
This session will present recent discoveries and innovations in friction materials development, particularly inorganic fillers, nanotube frictions, and the role of clay in friction material formulations.  
**Organizers:** Michael J. Scharbarger, David Antanaitis, General Motors LLC; Peter Filip, Southern Illinois Univ. at Carbondale. |
| 2:00 p.m. | **Technological and Business Sessions**  
**Technical Presentations**  
**Technical Presentations**  
**Technical Presentations**  
**Technical Presentations** |
| 2:20 p.m. | **Coated Friction Materials for Reduced Emissions in Friction Applications**  
**Technical Presentations**  
**Technical Presentations**  
**Technical Presentations**  
**Technical Presentations** |
| 2:40 p.m. | **Friction/Raw Materials Technical Presentations: (Part 2) (BC100)**  
This session will present recent discoveries and innovations in friction materials development, particularly inorganic fillers, nanotube frictions, and the role of clay in friction material formulations.  
**Organizers:** Michael J. Scharbarger, David Antanaitis, General Motors LLC; Peter Filip, Southern Illinois Univ. at Carbondale. |
| 3:40 p.m. | **Brake Systems Design for Dedicated BEV Architectures**  
**Technical Presentations**  
**Technical Presentations**  
**Technical Presentations**  
**Technical Presentations** |
| 5:20 p.m. | **Friction/Raw Materials Technical Presentations: (Part 3) (BC100)**  
This session will present recent discoveries and innovations in friction materials development, particularly inorganic fillers, nanotube frictions, and the role of clay in friction material formulations.  
**Organizers:** Michael J. Scharbarger, David Antanaitis, General Motors LLC; Peter Filip, Southern Illinois Univ. at Carbondale. |
<table>
<thead>
<tr>
<th>TIME</th>
<th>Salon A-F</th>
<th>Salon G-L</th>
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<tbody>
<tr>
<td></td>
<td>The session focuses on innovations with foundation brake and apply system components (calipers, rotors, drums, bearings, manual and electric park brakes, and actuation). It addresses integration at all levels (pad to caliper, caliper to corer, corner and actuation to vehicle). Examples include but are not limited to: component design, performance enhancements, system sizing/configuration, drag reduction, pedal feel, mass reduction, and thermal management by new designs/innovative materials.</td>
<td>Braking emissions are becoming more and more the focus of the public. In addition to fundamental questions of the quantitative detection of brake dust and its distribution in the environment, health questions are also essential. This session addresses measurement technology, theory and simulation for brake emission and ways to minimize the environmental impact.</td>
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<td>Organizers: David B. Antanaitis, General Motors LLC; Saikiran Divakaruni, ZF TRW Active &amp; Passive Safety Tech.; Chris McCormick, TRW Automotive Inc.; Mark Rieffe, General Motors</td>
<td>Organizers: Georg Peter Ostermeyer, Tu Braunschweig; John David Fieldhouse</td>
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<tr>
<td>8:20 a.m.</td>
<td><strong>Effectiveness of Corrosion Protection Methods on Disc Brake Pads and the Impact of Corrosion on Brake Pad Performance</strong> (Oral Only)</td>
<td><strong>Keynote: Pathways for Measuring Brake Wear PM for Modernizing Vehicle Emission Invenories</strong> (Oral Only)</td>
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<td>Scott Lambert, NUCAP Industries Inc.; Abdool Azaad, NUCAP Industries Inc</td>
<td>Gary Collier, California Air Resources Board</td>
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<td>8:40 a.m.</td>
<td><strong>Highest Corrosion Resistance for Brake Calipers by Choosing the Right Sealer</strong> (Oral Only)</td>
<td><strong>Brake Emissions a Global Challenge</strong> (Oral Only)</td>
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<td></td>
<td>Matthias Hoch, Atotech Deutschland GmbH</td>
<td>Harald Abendroth, Consultant; Theodoros Grigoratos, Joint Research Centre</td>
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<tr>
<td>9:00 a.m.</td>
<td><strong>Numerical and Experimental Investigation of Brake Bleeding Performance Improvements in an EPB Caliper</strong> (2018-01-176)</td>
<td><strong>A Novel Real-World Braking Schedule for Measuring Brake Wear PM and PN Emissions</strong> (Oral Only)</td>
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<td>JangOh Mo, Mando</td>
<td>Marcel Matthiesen, Ford Research and Innovation Center; Jaroslaw Grochowicz, Christian Schmidt, Ford Werke Gmbh; Rainer Vogt, Ferdinand Farwick zum Hagen, Ford Research and Innovation Center; Tomasz Grabcz, Ford Werke Gmbh; Heinz Steven, HS Data Analysis and Consultancy; Theodoros Grigoratos, Joint Research Centre</td>
</tr>
</tbody>
</table>
## Advances in Brake Component Design Technical Presentations: Part 2 (BC105)

The session focuses on innovations with foundation brake and apply system components (calipers, rotors, drums, bearings, manual and electric park brakes, and actuation). It addresses integration at all levels (pad to caliper, caliper to corner, corner and actuation to vehicle). Examples include but are not limited to: component design, performance enhancements, system sizing/configuration, drag reduction, pedal feel, mass reduction, and thermal management by new designs/innovative materials.

Organizers:
- David B. Antanaitis, General Motors LLC; Saikiran Divakaruni, ZF TRW Active & Passive Safety Tech.; Chris McCormick, TRW Automotive Inc.; Mark Riefe, General Motors LLC

### Technical Presentations

<table>
<thead>
<tr>
<th>Time</th>
<th>Title and Description</th>
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<tr>
<td>10:20 a.m.</td>
<td>Properties and Limitations of an Oxide Coated Aluminum Brake Rotor&lt;br&gt;(2018-01-1877)&lt;br&gt;Florian Gulden, Universität Erlangen-Nürnberg (FAU); Sebastian Grammatik, Arno Stich, Audi AG; Heinz Werner Hoppel, Universität Erlangen-Nürnberg (FAU); Ulrich Tetzlaff, Technische Hochschule Ingolstadt</td>
</tr>
<tr>
<td>10:40 a.m.</td>
<td>Lightweight, Wear Resistant, High Thermal Conductivity Metal Matrix Composite Brake Rotors&lt;br&gt;(2018-01-1879)&lt;br&gt;Lori Bracamonte, James Withers, Thomas Smith, ATS-MER, LLC</td>
</tr>
<tr>
<td>11:00 a.m.</td>
<td>Study on Influence Analysis of Rotors Slot and Optimization of Slot Design&lt;br&gt;(2018-01-1863)&lt;br&gt;Hyungoon Kim, Yoon Cheol Kim, Hyundai Motor Co.; Hankyo Seo, Sangsoon Brake; Jiekwang Seol, Chul Yoon, Kwang Yun Kim, Hyundai Motor Co.</td>
</tr>
<tr>
<td>11:20 a.m.</td>
<td>A Study of Brake Disc Basic Design to Improve the Cooling Property (Oral Only)&lt;br&gt;Kunahashi Masaki, ADVICS Co., Ltd.</td>
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<tr>
<td>10:00 a.m. - 11:40 a.m.</td>
<td>Organizers: Ho Jang, Korea Univ.; Harald Abendroth</td>
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</tbody>
</table>

## Fundamental Mechanisms of Friction and Vibration Technical Presentations (BC110)

The session focuses on the fundamentals of the interaction on the sliding surface and associated friction induced vibrations. From nanoscale interactions of the contacts on the sliding interface to macroscopic methodology to diminish friction induced vibrations, this session comprises new findings and discussion toward a step forward to full understanding of the friction and brake induced vibration.

Organizers:
- Ho Jang, Korea Univ.; Harald Abendroth

### Technical Presentations

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<th>Time</th>
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<tr>
<td>10:00 a.m. - 11:40 a.m.</td>
<td>Boundary Layer Dynamics and Sound Generation&lt;br&gt;(2018-01-1900)&lt;br&gt;Bastian Recke, Georg Ostermeyer, TU Braunschweig</td>
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<td>10:20 a.m.</td>
<td>Evolution of Contact Plateaus Leading to Negative Mu-v Slope and Noise Occurrence (Oral Only)&lt;br&gt;Jinwoo Kim, Sanghee shin, Ho Jang, Korea Univ</td>
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<tr>
<td>10:40 a.m.</td>
<td>On the Wear Dependence of Low-Frequency and High-Frequency Brake Squeal&lt;br&gt;(2018-01-1902)&lt;br&gt;Johannes Otto, Georg Ostermeyer, TU Braunschweig; Seong Rhee, SKR Consulting LLC</td>
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<td>11:00 a.m.</td>
<td>The Factors Governing the Corrosion Stiction of Brake Friction Materials Against a Gray Cast Iron Disc&lt;br&gt;(2018-01-1899)&lt;br&gt;Jae hyun Gwon, Sanghee Shin, Ho Jang, Korea Univ.; Wangyu Lee, Dooyeon Kim, Keeyang Lee, Hyundai Mobis</td>
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<td>11:20 a.m.</td>
<td>Study on Brake Disc Dynamics under Asymmetric Thermal Loads (Oral Only)&lt;br&gt;Dejian Meng, Jialin Liu, Jingyi Zhang, Lijun Zhang, Tongji Univ.</td>
</tr>
</tbody>
</table>
Tuesday, October 16

HIGH PERFORMANCE BRAKE SYSTEMS FOR CARS TECHNICAL PRESENTATIONS AND PANEL DISCUSSION
(Session Code: BC102)
Room Salon G-L
1:40 – 3 p.m.

Innovation on High Performance Brakes Panel Discussion
What are the latest trends in brake system technology for high performance applications? How are new materials, processes, regulations, and electrification shaping the brakes of tomorrow?

Organizers:
Michael O’Neil, Essex Parts Services Inc.; Marco Pagni, Brembo North America; Michael J. Schorn, Link Europe; Axel Stenkamp, TMD Friction GmbH

Panelists:
David B. Antanaitis, General Motors LLC
Nigel Francis, Lift
Marcello Giombini, Brembo North America
Thomas J. Hall, MaxG Technology LLC
Michael Lingg, Volkswagen Aktiengesellschaft
Donatus Neudeck, Porsche AG

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# TUESDAY, OCTOBER 16 - AFTERNOON
## Technical and Business Sessions

<table>
<thead>
<tr>
<th>TIME</th>
<th>SESSION TITLE, DESCRIPTION, AND ROOM</th>
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<td><strong>Advances in Brake Component</strong></td>
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<td><strong>Design Technical Presentations:</strong></td>
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<td>Part 3 (BC105)</td>
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<td>The session focuses on innovations</td>
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<td>park brakes, and actuation). It</td>
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<td>addresses integration at all levels</td>
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<td>corner and actuation to vehicle).</td>
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<td>Examples include but are not limited</td>
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<td>to: component design, performance</td>
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<td>enhancements, system sizing/</td>
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<td>configuration, drag reduction, pedal</td>
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<td>feel, mass reduction, and thermal</td>
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<td>management by new designs/innovative</td>
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<td>materials.</td>
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<td><strong>High Performance Brake</strong></td>
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<td><strong>Systems for Cars Technical</strong></td>
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<td><strong>Presentations with Panel</strong></td>
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<td><strong>Discussion (BC102)</strong></td>
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<td>This session focuses on brake</td>
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<td>systems for high performance sports</td>
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<td>cars and sedans. It includes new</td>
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<td>trends in brake system technology</td>
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<td>applied to these type of vehicles,</td>
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<td>how they differentiate from</td>
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<td>standard brake systems, and the</td>
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<td>specific development challenges on</td>
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<td>component and system levels. It also</td>
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<td>deals with the question of how the</td>
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<td>focus on performance and safety can</td>
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<td>be combined with comfort and life</td>
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<td>time requirements.</td>
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<td>1:00 p.m.</td>
<td>Increase of Stability for Motor Cars</td>
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<td>in Service Braking (2018-01-1880)</td>
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<td></td>
<td>Mikhail Podrigalo, Anatdzi Turanko,</td>
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<td>Viktor Bogomolov, Dmytro Kets, Kharkov</td>
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<td>Autonom. Univ.; Voildymyr VKarpenko,</td>
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<td>Igor V. Gritsk, Oleksandr Turanko,</td>
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<td>Andrii Kombiko, Kharkov National</td>
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<td>Auto &amp; Highway Univ.; Nickolay Bulgakov,</td>
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<td>Kherson State Maritime Academy;</td>
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<td>Oleksandr Bobovsko, Kharkov National</td>
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<td>Auto &amp; Highway Univ.</td>
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<td>1:20 p.m.</td>
<td>Improvement of the Methods of</td>
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<td>Evaluating the Dynamics of Brake</td>
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<td>Dynamics with Failure of ABS (2018-01-1881)</td>
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<td>Mikhail Podrigalo, Dmytro Kets, Kharkov</td>
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<td>Tarasov, Malakym Batsur, Kharkov</td>
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<td>National Auto &amp; Highway Univ.; Nickolay</td>
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<td>Bulgakov, Kherson State Maritime</td>
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<td>Academy; Vasyl Hatko, Kharkov National</td>
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<td>Auto &amp; Highway Univ.; Andrii Gokov,</td>
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<td>Odessa National Maritime Univ.;</td>
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<td>Volodymyr Savchuk, Malakym Arieiev,</td>
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<td>Kherson State Maritime Academy;</td>
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<td>Tetiana Bilousova, Kherson National</td>
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<td>Technical Univ.</td>
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<td>1:40 p.m.</td>
<td>Light-weight Composite and Galvanized</td>
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<td>Back-plates with Mechanical-Retention</td>
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<td>for Brake Pads (Oral Only) (Oral Only)</td>
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<td>Parimal Mody, NUCAP Industries Inc.</td>
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<td>2:00 p.m.</td>
<td>Comparison of Different Variable</td>
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<td>Braking Force Systems (2018-01-1885)</td>
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<td>Chidambaram Subramanian, Virginia Tech</td>
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<td>Graduate Student; Ganeshi Vinayaga</td>
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<td>Sundaram, Sri Venkateswara College of</td>
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<td>Engineering</td>
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<td><strong>Keynote: Usage of Emission Reduced,</strong></td>
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<td><strong>Ceramic Plated Cast Iron Rotors on</strong></td>
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<td><strong>High Performance Cars</strong></td>
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<td>Donatus Neudeck, Porsche AG</td>
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<td><strong>Innovation on High Performance Brakes</strong></td>
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<td><strong>Panel Discussion</strong></td>
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<td>2:00 - 3:00 p.m.</td>
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<td>What are the latest trends in brake</td>
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<td>system technology for high performance</td>
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<td>applications? How are new materials,</td>
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<td>processes, regulations, and</td>
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<td>electrification shaping the brakes of</td>
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<td>tomorrow?</td>
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<td><strong>Panelists:</strong></td>
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<td>David B. Antanaitis, General Motors</td>
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<td>LLC; Nigel Francis, Lift; Marcello</td>
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<td>Giombini, Brembo North America;</td>
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<td>Thomas J. Hall, MaxG Technology LLC;</td>
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<td>Michael Ling, Volkswagen;</td>
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<td>Akteingesellschaft; Donatus Neudeck,</td>
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<td>Porsche AG</td>
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</tbody>
</table>
## TECH SESSIONS

### TUESDAY, OCTOBER 16 - AFTERNOON

#### Technical and Business Sessions

<table>
<thead>
<tr>
<th>TIME</th>
<th>Salon G-L</th>
<th>Salon A-F</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Heavy Trucks Technical Presentations (BC125)</strong></td>
<td><strong>Brake Emissions Technical Presentations: Part 2 (BC122)</strong></td>
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<td>This session will feature international experts addressing critical braking issues related to the performance and safety of commercial vehicles. Topics include transitioning from drums to air brakes, roll stability, global regulatory and standards review, and braking strategies for hill descent.</td>
<td>Braking emissions are becoming more and more the focus of the public. In addition to fundamental questions of the quantitative detection of brake dust and its distribution in the environment, health questions are also essential. This session addresses measurement technology, theory and simulation for brake emission and ways to minimize the environmental impact.</td>
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<tr>
<td>3:40 p.m. - 5:20 p.m.</td>
<td>Organizers: John David Fieldhouse, JDF Consulting; Roy H. Link, Link Engineering Co.; Gregory Vyletel, Federal-Mogul Motorparts</td>
<td>Organizers: Georg Peter Ostermeyer, Tu Braunschweig; John David Fieldhouse</td>
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<td>4:00 p.m.</td>
<td>Jay White, Hendrickson</td>
<td>Sebastian Grammatik, Audi AG; Dmytro Lugovyy, Horiba Europe GmbH; Robert Waninger, Audi AG; Matthias Schroeder, Horiba Europe GmbH</td>
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<td>4:20 p.m.</td>
<td>Michael Jensen, CNH Industrial</td>
<td>Hartmut Niemann, Hermann Winner, Technische Universitat Darmstadt; Christof Asbach, Heinz Kaminski, IUTA Dusseldorf; Marco Zessinger, Link Europe</td>
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<tr>
<td>4:40 p.m.</td>
<td>A Study on Safety Intelligent Driving System for Heavy Truck Downhill in Mountainous Area (2018-01-1887)</td>
<td></td>
</tr>
<tr>
<td>4:40 p.m.</td>
<td>Jakang Quan, Wuhan Univ. of Technology; Yanming Zhao, Beijing Institute of Space Launch Technology; Gangfeng Tan, Yongfeng Xu, Bo Huang, Tianming He, Wuhan Univ. of Technology</td>
<td></td>
</tr>
<tr>
<td>5:00 p.m.</td>
<td>A New Model Describing the Formation of Heat Cracks in Brake Discs for Commercial Vehicles (2018-01-1882)</td>
<td></td>
</tr>
<tr>
<td>5:00 p.m.</td>
<td>Sami Bilgic Istoce, Hermann Winner, Technische Universitat Darmstadt</td>
<td></td>
</tr>
</tbody>
</table>

### Networking Reception

**Springs Patio**

**Tuesday, October 16**

5:30-7 p.m.

### Dessert Station

**Sponsored by:**
## TECH SESSIONS

### WEDNESDAY, OCTOBER 17 - MORNING

#### Technical and Business Sessions

<table>
<thead>
<tr>
<th>Time</th>
<th>Salon G-L</th>
<th>Salon A-F</th>
<th>Salon A-F</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 a.m.</td>
<td>Design Optimization of the Disc Brake for Squeal Noise Reduction</td>
<td>Dynamoometer Brake Squeal vs. Pad FRF, Compressibility, Hardness, and Modulus with High Sample Size (Oral Only)</td>
<td>Nathanie Mosher, Akebono Brake Corporation; Weicheng Wang, Akebono Corp., Scott Severnak, Taylor Ballas, Akebono Brake Corporation</td>
</tr>
<tr>
<td>(2018-01-1874)</td>
<td>Jintack Park, Mando Corp.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8:20 a.m.</td>
<td>Incorporation of Friction Material Surface Inhomogeneity in Complex Eigenvalue Analysis to Improve the Accuracy of Brake Squeal Prediction (Oral Only)</td>
<td>Investigation of Suction Phenomena in Brake Systems by Electrochemical Methods (Oral Only)</td>
<td>Agast Sin, ITT Friction Technologies</td>
</tr>
<tr>
<td>8:40 a.m.</td>
<td>Caliper Robustness for Global Applications (Oral Only)</td>
<td>A Study of the Disc Scoring Generation Principle and Reduction(II)</td>
<td></td>
</tr>
<tr>
<td>9:00 a.m.</td>
<td>Drum Brake Squeal Prediction by CEA and Modal Participation Factor Evaluation (Oral Only)</td>
<td>Adaptronic Actuator to Minimize the Pins Miscalignment on Pin-on-Disc Testers (2018-01-1892)</td>
<td>Alexander Vogel, Georg-Peter Ostermeyer, TU Braunschweig</td>
</tr>
<tr>
<td>10:00 a.m.</td>
<td></td>
<td>Brake Dynamometer Control Strategy and Correlation to Vehicle (Oral Only)</td>
<td>Cara L. Learman, General Motors LLC</td>
</tr>
<tr>
<td>10:40 a.m.</td>
<td></td>
<td>Modeling Articulated Brake Component Wear to Assist with Routing Decisions (2018-01-1890)</td>
<td>David B. Antanaitis, General Motors LLC</td>
</tr>
<tr>
<td>11:20 a.m.</td>
<td></td>
<td>Use of a Vehicle Chassis Dynamometer for Brake Thermal Testing (Oral Only)</td>
<td>Mark Riefe, Brent Love, General Motors LLC</td>
</tr>
</tbody>
</table>
THE IMPACT TO BRAKE DESIGN WITH RE-GEN BRAKING PANEL DISCUSSION  
(Session Code: BC127) 
Room Salon G-L 
10 – 11:40 a.m.

The panel will discuss broad discussion surrounding the electrification, system differential with re-gen braking, and help the brake system/components suppliers to align future with market needs, and identify the technical area to focus on. Each panelist will share their vision with the industry, and provide with insight of some technical challenges to focus on.

Organizers:  
HT Chang, Brake Parts Inc.; Saikiran Divakaruni, ZF TRW Active & Passive Safety Tech.

Moderator: HT Chang, Brake Parts Inc.

Panelists: 
Pietro Durando, ITT Italia Srl  
Charles K. Evans, Ford Motor Company  
Scott Lambert, NUCAP Industries Inc.  
Toshikazu Okamura, KIRIU Corp.  
Michael J. Romanowski, ZF  
Michael J. Shenberger, General Motors LLC

SAE STANDARDS UPDATE  
(Session Code: BC124)  
Room Salon A-F  
12:40 – 2 p.m.

The panel discussion will provide a series of brief presentations updates on the most critical brake related standards work being developed via Committee in the areas of NVH, Linings, Hydraulics, fluids, steering and dynamometer. Following these talks will be the opportunity for the audience to engage in a Q&A period to address those issues around standards development that is of utmost criticality to discuss.

Organizer & Moderator:  
Timothy Duncan, Link Engineering Company

Panelists: 
Steve Brown, Samarium LLC & Brake Steering Committee  
Eric Denys, Wolverine Advanced Materials & NVH Standards Committee  
Charles Greening, Greening Inc & Brake Fluids Standards Committee  
David Antanaitis, General Motors LLC & Automotive Brake & Power Steering Hose Committee  
Carlos Agudelo, Link Engineering & Brake Dynamometer Committee  
Rick Kaatz, KB Autosys & Brake Linings Standards Committee  
Mark Riefe, General Motors LLC & Hydraulic Brake Components Committee
## TECH SESSIONS

### SESSION TITLE, DESCRIPTION, AND ROOM

<table>
<thead>
<tr>
<th>TIME</th>
<th>SESSION TITLE</th>
<th>DESCRIPTION</th>
<th>ROOM</th>
</tr>
</thead>
<tbody>
<tr>
<td>12:40 p.m.</td>
<td>Nominal Stress Calculation Based on FEA Element Nodal Forces</td>
<td>(2018-01-1898) Li Lee, Christian Ball, Gang Lou, Akebono Brake Corp.</td>
<td>Salon G-L</td>
</tr>
<tr>
<td>1:00 p.m.</td>
<td>Thermal-Mechanical Instabilities in Brake Discs</td>
<td>(2018-01-1894) Yun-Bo Yi, Joseph-Shaahu Shaahu, Univ. of Denver; Zhuo Chen, Henan Univ. of Technology</td>
<td></td>
</tr>
<tr>
<td>1:40 p.m.</td>
<td>A Mathematical Model of the Braking Dynamics of a Car</td>
<td>(2018-01-1893) Olexii Saraiev, Kharkov National Auto &amp; Highway Univ.; Yuliya Gorb, Univ. of Houston</td>
<td></td>
</tr>
<tr>
<td>2:00 p.m.</td>
<td>Break</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:10 p.m.</td>
<td>Pad Rattle Simulation</td>
<td>(Oral Only) Stefan Weiland, Stanley Baksi, Thomas Vasel, Joachim Noack, Daniel Schwarz, ZF Group</td>
<td></td>
</tr>
<tr>
<td>2:30 p.m.</td>
<td>Efficient Part Replacement for Non-Linear Simulation Models with Focus on Brake NVH Behaviour</td>
<td>(Oral Only) Michael Klein, INTES GmbH</td>
<td></td>
</tr>
<tr>
<td>2:50 p.m.</td>
<td>Innovative Shim Implementation in Squeal-Analysis Models.</td>
<td>(Oral Only) Halewijn Stikvoort, Martin Søgaard, Jens Thuesen, Meneta Advanced Shims Technology A/S</td>
<td></td>
</tr>
</tbody>
</table>
PARTICIPANTS INDEX

A

Abendroth, Harald ........................................ 19, 20
Agudelo, Carlos ........................................ 23, 24
Ahieiev, Maksym ........................................ 22
Antanitis, David .......................................... 18
Antanitis, David B ........................................ 18, 19, 20, 22
Antunes, Diego Severo .................................. 24
Asbach, Christof .......................................... 23
Azaab, Abdool ............................................. 19

B

Backstrom, Alan .......................................... 15
Ball, Tsu-Mai ............................................. 22
Ball, Christian ............................................ 26
Barrett, Jon ................................................ 15
Biallas, Taylor ............................................ 24
Bilousova, Tetiana ....................................... 24
Bobobsho, Oleksandr .................................. 22
Bogomolov, Viktor ...................................... 22
Bonfant, Andrea ........................................... 18
Bottalico, Luca ........................................... 18
Bracamonte, Loris ....................................... 20
Bulgakov, Nickolay ...................................... 22

C

Chang, Yeon Ha .......................................... 18
Chen, Zhuo .................................................. 26
Cheon, Jae Seung ......................................... 18
Cho, Jun Hw ............................................... 15
Chung, Jin Taek ........................................... 20
Collier, Sonya ............................................... 19

D

Daimon, Emiko ........................................... 18
Denys, Eric ................................................. 24
Deshpande, Moresh ..................................... 26
Divakaruni, Saikiran ..................................... 19, 20, 22
Dowing, Jon ............................................... 18, 24
Dzikinski, Richard E ..................................... 18

F

Fash, James ................................................ 18
Fieldhouse, John David ................................ 19, 23
Filip, Peter .................................................. 18, 24
Fujii, Masahiro ........................................... 15

G

Giombini, Marcello ...................................... 22
Golovan, Andrii .......................................... 22
Gorb, Yuliya .................................................. 26
Grabiec, Tomasz .......................................... 19
Gramst, Sebastian ........................................ 20, 23
Grosartatos, Theodoros ................................ 19
Gritsun, Igor V ............................................. 22
Grochowicz, Jaroslav .................................. 19
Groß, Raif ................................................... 18, 24
Grubaugh, Kelly T ....................................... 15
Gulden Florian ............................................. 20
Gweon, Jaehyun ............................................ 20

H

Hachmann, Peter ......................................... 24
Haehn, Richard ........................................... 15
Hagen, Ferdinand Farwick zum .................. 19
Hall, Thomas ............................................. 22
Han, Wei ..................................................... 18
HARADA, Naoyuki .................................... 18
Hatsko, Vasyl ............................................. 22
He, Taiming ................................................ 23
Hoch, Matthias ............................................ 19
Hoppel, Heinz Werner ................................ 20
Huang, Bo .................................................. 23
Hwang, Han ............................................... 22

I

Ishida, Koki .................................................. 15
Ishiguro, Michiko ......................................... 18
Istoc, Sami Biligic ....................................... 23

J

Jang, Ho ....................................................... 18, 20, 24
Jensen, Michael ......................................... 23
Jeong, Byeonguk ........................................ 22
Jogineed, Robin .......................................... 18
Joo, Byung Soo ............................................ 24
Jung, Kwang Ki ........................................... 24
Jung, Sunho ............................................... 20

K

Kaede, Kazunori ......................................... 24
Kaeub, Kristina ........................................... 18
Kabikara, Kenji ........................................... 18
Kalan, Dinesh ............................................. 26
Kaminski, Heinz ......................................... 23
Kancharia, Sai Krishna .................................. 18
Kay, Joseph .................................................. 22
Khalilov, Nickolay ...................................... 22

L

Lambert, Scott ............................................ 19
Lee, Byung-choen ....................................... 22
Lee, Byung Ju ............................................. 20
Lee, Heewook ............................................. 26
Lee, Hyunyoung .......................................... 23
Lee, Jaeyong ............................................... 20
Lee, Keeang .................................................. 20
Lee, K. Mike ................................................ 26
Lee, Li ........................................................ 26
Lee, Seunggyo ............................................. 15, 20
Lee, Wangyu ............................................... 20
Lescot, Erik .................................................. 15
Link, Roy H ................................................... 23
Liu, Jialin .................................................... 20, 24
Liu, Weiming ............................................. 20
Lopez, Jose Luis ......................................... 18
Lou, Gung ..................................................... 26
Low, Brent .................................................... 24
Lupov, Joseph ............................................. 20
Luk, Sydney H .............................................. 18

M

masaki, Kurashiki ........................................... 20
Massotti, Diego ............................................ 22
Mathiesen, Marcel ....................................... 19
Matozo, Luciano ......................................... 24
Matsuzaka, Masanori ................................... 24
McCormick, Chris ...................................... 19, 20, 22
McKavanagh, David .................................. 24
Meng, Dejian .............................................. 20
Mifuka, Hajime ............................................ 18
Mody, Parimal ............................................. 22
Mo, Jang Oh ................................................. 19
Moster, Nathanial ........................................ 24
Muramatsu, Keichi ...................................... 24
Neudeck, Donatus .................................... 22
Niemann, Hartmut ..................................... 23
Nishiwaki, Masaaki ..................................... 24
Nishizawa, Yuto ......................................... 24
Noack, Joachim .......................................... 18, 24, 26

N

Neudeck, Donatus .................................... 22
Niemann, Hartmut ..................................... 23
Nishiwaki, Masaaki ..................................... 24
Nishizawa, Yuto ......................................... 24
Noack, Joachim .......................................... 18, 24, 26

O

Odom, Tyler .................................................. 23
O’Neill, Michael .......................................... 22
Ostermeyer, Georg-Peter ...................... 19, 20, 23, 24
Otto, Johannes .......................................... 20

P

Pagni, Marco ............................................... 22
Park, Jintack ............................................. 22
Park, Jong Sung .......................................... 18
Park, Joo Sang ............................................ 24
Park, Junho ................................................. 22
Patil, Vishal ................................................. 18
Pernson, Femmo .......................................... 18
Perzborn, Nils ............................................. 18
Pfettl, Kevin ................................................ 15
Podgiralo, Mikhail ....................................... 22
Puetz, Thomas ............................................ 18
Quan, Jiakang ............................................ 23
R

Rampinelli, Flavio ....................................... 18
Ranza, Luigi ................................................... 18
Recke, Bastian ............................................ 20
Rhee, Seong ............................................... 22
Riefe, Mark ................................................. 19, 20, 22, 24
Roberge, Matthew ....................................... 19, 24
Romeo, Mario ............................................. 18
Ryu, Hyoong Tae ......................................... 24

S

Sales, Eros ................................................. 18
Salmon, Eric ............................................... 18
Samela, Alessandro ...................................... 20
Sanguineti, Alessandro ................................ 18
Saraiey, Olexi .............................................. 26
Savchuk, Volodymyr .................................. 24
Schmidt, Christian ...................................... 19
Schorn, Michael J ........................................ 22
Schroeder, Matthias .................................... 23
Schwarz, Daniel .......................................... 26
Seo, Hankyo ................................................ 20
Seol, Jaekwang ............................................ 20
Serigienko, Oleg ........................................ 22
Serevnik, Scott .......................................... 24
Shaahu, Joseph-Shaahu ................................ 26
Shaffer, Steven .......................................... 18, 24
Shaffer, Steven J .......................................... 18
Sherenberger, Michael J ................................ 18
Shen, Shuangdong ....................................... 18
Shi, Baofei .................................................. 24
Shimada, Yoshinori ...................................... 18
shin, Sanghee .............................................. 20
Shin, Sanghee .............................................. 20
Simm, Hyongbo ........................................... 26
Sin, Agusti ................................................... 24
Smith, Thomas ............................................. 20
Sagadat, Martin ........................................... 26
Soloviev, Oleg ............................................. 18
Sriviboon, Meechai ..................................... 18
Stenkamp, Axel ............................................ 22
Steven, Heinz ............................................. 19
Stich, Anton ................................................ 20
Stilkvoort, Halwin ....................................... 26
Subramanian, Chidambaram ...................... 22
Suganuma, Yuzo ........................................... 18
Sukumaran, Suraj ........................................ 26

T

Tan, Sangpeng ............................................ 22
Tarasov, Yuriy ........................................... 22
Tetzlaff, Ulrich ............................................ 20
Thuesen, Jens ............................................. 26
Tiempa, Nipon ............................................. 22
Turenko, Oleksandr .................................... 22

U

V

VAKarpenko, Volodymyr ................................ 22
Vase, Thomas ............................................. 26
Vedula, Ravi Teja ........................................ 23
Vogel, Alexander ....................................... 24
Vogt, Rainer ............................................... 19
Vyletel, Gregory ......................................... 23

W

Wang, Weicheng ......................................... 24
Waninger, Robert ....................................... 23
Watanuki, Keiichi ....................................... 24
Weiland, Stefan .......................................... 18, 24, 26
White, Jay ................................................... 23
Winner, Hermann ....................................... 23
Withers, James .......................................... 20
Wu, Shenchun ............................................. 18

Y

Yamamoto, Yukio ........................................ 24
Yi, Yun-Bo .................................................. 26
Yoon, Chul .................................................. 20
Yu, Zhihong ............................................... 18

Z

Zessinger, Marco ........................................ 23
Zhang, Jingyi ............................................. 20, 24
Zhang, Liujun ............................................. 18
Zhao, Yanming ............................................ 23
Zhuo, Guirong ............................................ 18

Brake Colloquium & Exhibition

27
CALL FOR PAPERS/PRESENTATIONS

Brake Colloquium & Exhibition
September 22-26, 2019 | Orlando, Florida

The Brake Colloquium’s Technical Program Committee is looking for submissions from industry and academia that showcase advancements and innovations that meet the expectations of industry and the end user customers.

Nowhere else in North America can individuals looking for the science and technology of brakes come together and make the critical connections that will improve job performance by networking with experts in the brake community.

Topics Under Consideration
- Friction Materials
- Raw Materials
- Disc and Drum Materials/Design
- Backing Plates
- Noise Shims and Grease
- Automotive Brakes
- Commercial Vehicle Brakes
- Railway Brakes
- Wheel Bearings
- Impact of Fuel Economy on Brake Design
- High Performance Brakes
- Electric/Electronic Braking
- Braking for Electric, Hybrids, and Automated Driving
- Testing and Measurement
- NVH
- CAE
- Fundamental Mechanisms of Friction and Vibration
- New Innovative Technologies/Products
- Actuator and Actuation Systems
- Calipers/Brake Corners/Wheel Bearings/Assembly
- Advancements in Wet Friction
- Brake Fluids
- Aftermarket Brakes and Components
- Regulations and Standards
- Emission and Environmental
- Manufacturing and Quality
- Brake Hoses
- Controls & Mechatronics for Hybrid and Conventional Vehicles
- AEB
- ADAS
- Other

Abstracts must be submitted online via website page to only ONE session. Offered papers shall not have been previously published; and if accepted, contributors will not release their paper for publication through other media.

- Paper acceptance will be based on organizer moderated peer review of a review ready manuscript.
- Refer to the author resources site at volunteers.sae.org/authors.htm for other useful information in preparing your paper.
- Portal for submission of abstracts will be open on October 14, 2018
- Deadline for submitting paper offers February 17, 2019
- Review Ready Manuscripts due to session organizers March 31, 2019
- Final Manuscripts and copyright assignments due to SAE June 16, 2019
- Authors will be charged a nominal registration fee for colloquium attendance.

For questions contact
Kaleigh Matyas
SAE International
+1.724.772.4047
kaleigh.matyas@sae.org

General Author Resources Page
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Reviewer Resources
If you are interested in becoming a paper reviewer, guidance and judgement information is provided here volunteers.sae.org/reviewers.htm
### EXHIBITOR LIST

<table>
<thead>
<tr>
<th>Company</th>
<th>Booth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Airoko Inc.</td>
<td>208</td>
</tr>
<tr>
<td>American Metal Fibers Inc</td>
<td>509</td>
</tr>
<tr>
<td>Anhui Guida Auto Parts Co Ltd</td>
<td>203</td>
</tr>
<tr>
<td>Anqing Hualan Technology Co Ltd</td>
<td>416</td>
</tr>
<tr>
<td>Applis IDIADA</td>
<td>50</td>
</tr>
<tr>
<td>Asbury Carbons</td>
<td>400</td>
</tr>
<tr>
<td>Atotech USA LLC</td>
<td>510</td>
</tr>
<tr>
<td>Bruker Corporation</td>
<td>417</td>
</tr>
<tr>
<td>BSS Tec International Corp.</td>
<td>101</td>
</tr>
<tr>
<td>Cardolite Corporation</td>
<td>111</td>
</tr>
<tr>
<td>Climatic Testing Systems Inc</td>
<td>40</td>
</tr>
<tr>
<td>Cocan Graphite</td>
<td>201</td>
</tr>
<tr>
<td>Comec Grinding Machines &amp; Presses</td>
<td>215</td>
</tr>
<tr>
<td>Daico Automotive Products SPA</td>
<td>103</td>
</tr>
<tr>
<td>Daiichi Kigenso Kagaku Kogyo Co Ltd</td>
<td>204</td>
</tr>
<tr>
<td>Daishin Kako Company Ltd</td>
<td>309</td>
</tr>
<tr>
<td>Dekati Ltd.</td>
<td>102</td>
</tr>
<tr>
<td>Entech, Inc.</td>
<td>115</td>
</tr>
<tr>
<td>Erlmann GmbH</td>
<td>408</td>
</tr>
<tr>
<td>Excalibur Minerals LLC</td>
<td>20</td>
</tr>
<tr>
<td>Expoliter Molybdenum Co Ltd</td>
<td>314</td>
</tr>
<tr>
<td>Fritz Winter Eisengiesserei GmbH &amp; Co KG</td>
<td>216</td>
</tr>
<tr>
<td>Golden Cashew Products Pvt Ltd</td>
<td>104</td>
</tr>
<tr>
<td>Greene Inc.</td>
<td>410</td>
</tr>
<tr>
<td>Gun El Chemical Industry Co Ltd</td>
<td>415</td>
</tr>
<tr>
<td>HEF USA</td>
<td>214</td>
</tr>
<tr>
<td>Hi-Pad Brake Technology</td>
<td>109</td>
</tr>
<tr>
<td>Horiba Instruments Inc</td>
<td>513</td>
</tr>
<tr>
<td>ILJIN USA Corporation</td>
<td>514</td>
</tr>
<tr>
<td>IMERYS Fused Minerals</td>
<td>505</td>
</tr>
<tr>
<td>Industrial Measurement Systems Inc</td>
<td>209</td>
</tr>
<tr>
<td>International Brake Industries Inc</td>
<td>100</td>
</tr>
<tr>
<td>Itapochim Spa</td>
<td>106</td>
</tr>
<tr>
<td>ITT Fine Blanking</td>
<td>200</td>
</tr>
<tr>
<td>Jiangxi Fengzhu New Materials Tech Co</td>
<td>502</td>
</tr>
<tr>
<td>Link Engineering Company</td>
<td>409</td>
</tr>
<tr>
<td>Linyi Hongtu Electron Co Ltd</td>
<td>401</td>
</tr>
<tr>
<td>MacDermid Enthone Industrial Solutions</td>
<td>105</td>
</tr>
<tr>
<td>MaGyc Srl.</td>
<td>503</td>
</tr>
<tr>
<td>Meneta</td>
<td>402</td>
</tr>
<tr>
<td>Midwest Elastomers</td>
<td>211</td>
</tr>
<tr>
<td>Mitsubishi Chemicals America Inc</td>
<td>415</td>
</tr>
<tr>
<td>Morgan Advanced Materials</td>
<td>305</td>
</tr>
<tr>
<td>Morimura Bros. (U.S.A.) Inc.</td>
<td>418</td>
</tr>
<tr>
<td>Niagara Brake International</td>
<td>110</td>
</tr>
<tr>
<td>NTN Automotive Center</td>
<td>319</td>
</tr>
<tr>
<td>NUCAP Industries Inc</td>
<td>301</td>
</tr>
<tr>
<td>Otsuka Chemical America Inc</td>
<td>515</td>
</tr>
<tr>
<td>Palmer International Inc</td>
<td>205</td>
</tr>
<tr>
<td>Parker Trutec, Inc.</td>
<td>119</td>
</tr>
<tr>
<td>Polytec Inc</td>
<td>501</td>
</tr>
<tr>
<td>Preferred Automotive Components</td>
<td>311</td>
</tr>
<tr>
<td>Procotex Corporation sa</td>
<td>419</td>
</tr>
<tr>
<td>PureForge Inc</td>
<td>10</td>
</tr>
<tr>
<td>Quartz S R L SU</td>
<td>117</td>
</tr>
<tr>
<td>RIMSA</td>
<td>508</td>
</tr>
<tr>
<td>Sadeca Automotive SLU</td>
<td>210</td>
</tr>
<tr>
<td>Shamokin Carbons</td>
<td>518</td>
</tr>
<tr>
<td>Shenyu Molybdenum Co., Ltd.</td>
<td>108</td>
</tr>
<tr>
<td>Showa Denko Carbon Inc.</td>
<td>511</td>
</tr>
<tr>
<td>Specialty Lubricants Corp.</td>
<td>300</td>
</tr>
<tr>
<td>Sterling Fibers</td>
<td>411</td>
</tr>
<tr>
<td>Sumitomo Bakelite Co., Ltd.</td>
<td>515</td>
</tr>
<tr>
<td>Superior Graphite Co.</td>
<td>405</td>
</tr>
<tr>
<td>TAM Ceramics Inc.</td>
<td>217</td>
</tr>
<tr>
<td>Taprath Elastomers LLP</td>
<td>414</td>
</tr>
<tr>
<td>Trelleborg Sealing Solutions</td>
<td>315</td>
</tr>
<tr>
<td>UTIL Group</td>
<td>302</td>
</tr>
<tr>
<td>Vibrations Inc.</td>
<td>316</td>
</tr>
<tr>
<td>Winhere Brake Parts Inc</td>
<td>500</td>
</tr>
<tr>
<td>Wolverine Advanced Materials</td>
<td>308</td>
</tr>
<tr>
<td>Xinlida Auto Parts LLC</td>
<td>318</td>
</tr>
</tbody>
</table>
EXHIBITOR PROFILE

Exhibitor Directory text is published as submitted by exhibiting companies.

ALROKO INC.  
Booth 208
19 Clinton St.
Pleasantville, NY 10570
United States
alroko.com

For more than 30 years Alroko is the exclusive sales representative for many important producers of raw materials and machine manufacturers around the world. We supply technically advanced products of constantly high quality, always emanating from the same established sources. Further we supply machines for producing and testing friction materials.

AMERICAN METAL FIBERS INC  
Booth 509
13420 Rockland Rd
Lake Bluff, IL 60044
United States
amfi.usa.com

American Metal Fibers, Inc. experience with metal fibers and other high temperature fibers, combined with manufacturing and technical development personnel, offers a range of skills and technology from around the world. American Metal Fibers, Inc. is certified according to the current ISO 9001 and TS 16949 standards.

ANHUI GUIDA AUTO PARTS CO LTD  
Booth 203
Xinwu Economic Development Zone
No.2368 Nanci 1st Road
Wuhu, Anhui Province. 241100
China
gdbrakes.com

Guida mainly specializes in the production of backing plate, brake steel shoe and related accessories. Less consumable, low scrap, exact dimensions, good flatness is very popular to our target customer. Products exported to Europe, Middle East, South East Asia and other places.

ANQING HUALAN TECHNOLOGY CO LTD  
Booth 416
Zone, Daguan District
No.8,Xiangzhang Rd, Recycling Economy Industry
Anqing City 246002
China
hs-hl.com

Anqing Hualan Technology Co.Ltd is specialized in R&D, production and marketing of NBR powder and NBR latex.

APPLUS IDIADA  
Booth 50
100 W Big Beaver Rd Ste 200
Troy, MI 48084
United States
applusidiada.com

With 25 years of history and 2,500 engineers, IDIADA is an engineering company providing design, testing and engineering services to the automotive industry. Leader in brake development services in Europe and Asia, the company is also located in Michigan and recently in California to be closer to its US clients.

ASBURY CARBONS  
Booth 400
405 Old Main St
Asbury, NJ 08802
United States
asbury.com

Established in 1895, Asbury Carbons is a family owned and operated company dedicated to developing high-performance products and Engineered Solutions that meet the demands of traditional and emerging friction applications. As the world’s largest independent processor of carbon and graphite, and an ISO certified company, Asbury offers the largest selection of both high-quality carbon and non-carbon products.

ATOTECH USA LLC  
Booth 510
1750 Overview Dr
Rock Hill, SC 29730
United States
atotech.com

Atotech is a global leader in plating chemicals, equipment and services for decorative and functional surface finishing as well as for communications electronics. Our General Metal Finishing division offers perfectly matched solutions in all our key technology areas – decorative and corrosion protection coatings, wear resistant coatings and paint support technology.

BRUKER CORPORATION  
Booth 417
3400 E Britannia Dr
Tucson, AZ 85706
United States
bruker.com

As the worldwide leader in measurement solutions, Bruker will be presenting the UMT TriboLab mechanical testing system at Booth 417. The TriboLab is the only benchtop friction material tester available that offers friction and thermal results in line with large-scale dynos, while paving the way in particulate matter collection.
BSS TEC INTERNATIONAL CORP  
Booth 101

no 5 Yongkehuan Rd Yongkang Dist  
Tainan City 71041  
Taiwan

bsstec.com.tw

BSS TEC is a professional braking components manufacturer which originally focused on fine backing plates. In 2017, we expanded our scale and acquired a shoe core company which has more than 40 years of experience and the widest range in Taiwan.

CARDOLITE CORPORATION  
Booth 111

11 Deerpark Dr Ste 124  
Monmouth Junction, NJ 08852  
United States

cardolite.com

Since more then 30 years, Cardolite is the world leader in cashew nutshell liquid technology. We offer a wide range of bio based products for the coatings, composites, adhesives, sealants and friction industry.

CLIMATIC TESTING SYSTEMS INC  
Booth 40

7339 Currie Rd  
Northville, MI 48168  
United States

climatictesting.com

Climatic Testing Systems, Inc. (CTS) is a leading single-source supplier of Environmental Conditioning Units (ECUs) and Test Chambers for the Brake Testing Industry. CTS utilizes its expertise in refrigeration and air conditioning systems and controls to provide our customers with comprehensive services for the design, supply, installation and maintenance of environmental test facilities.

COCAN GRAPHITE  
Booth 201

Ste 1804 Xinguang Bldg 971th Jianshe Ave  
Wuhan  430010  
China

cocangraphite.com.cn

We, Cocan Graphite, have grown up as a leader in powder carbon and graphite industry. Our products range from graphite to coke, from synthetic to natural types of carbonaceous materials. All of our inbound raw materials and outbound products are carefully tested and certified by our cutting-edge Cocan R&D Center. Cocan, refines your life!

COMElec GRINDING MACHINES & PRESSES  
Booth 215

viale del Commercio 40  
Piacenza 29122  
Italy

comec-grinders.com

Founded in 1963, COMEC specializes in the design and manufacturing of special machine tools. In the last 20 years, COMEC focused especially on developing Grinding & Pressing Technologies for the Friction Material Industry. Our customers are the most important groups and companies operating in the friction industry worldwide.

DAICO AUTOMOTIVE PRODUCTS SPA  
Booth 103

Via Goretta 84/B  
Mappano (Torino) 10072 (TO)  
Italy

daicospa.com


DAIICHI KIGENSO KAGAKU KOGYO CO LTD  
Booth 204

4-4-7 Imabashi 4 Chome Chuo-ku  
Osaka  541-0042  
Japan

http://dkkk.co.jp

Daiichi Kigenso Kagaku Kogyo Co., Ltd. has been developing ZrO2 and ZrSiO4 brake materials for half a century, and contributing to improve and stabilize friction coefficient for major brake manufacturers in Japan. Now our stage is changing from Asia to the world. We believe our technology and quality will satisfy your expectations. Please visit our booth at 204.

DAISHIN KAKO COMPANY LTD  
Booth 309

2-5-8 Shibadaimon Minato-ku  
Tokyo  105-0012  
Japan

daishinkako.com

Daishin Kako Company Ltd is based in Tokyo and has been studying the use of greases and other lubricating materials used for the prevention of brake noise and squeal for four decades. Daikalub 528D is the latest development and is approved by numerous automobile manufacturers and component suppliers located worldwide.
DEKATI LTD.  
Tykkitie 1  
Kangasala  FI-36240  
Finland  
dekati.fi

Dekati Ltd. has provided high quality instrumentation for fine particle measurement successfully for over 20 years. Our measurement solutions include complete fine particle measurement setups. Dekati® Solutions for brake wear measurements include:
• Real-time particle concentration and size distribution 6 nm - 10 µm  
• Sample conditioning and dilution solutions

ENTECH, INC.  
10440 County Road 2  
Middlebury, IN  46540  
United States  
4entech.com

Entech is a leading producer of micronized rubber powders (MRP). MRP has been in use in the brake industry for over sixty years. Our MRP is of the highest quality and provides such benefits as low density, thermal insulation, noise reduction, and is cost competitive.

ERLMANN GMBH  
Hohewardstrasse 350  
Herten  45699  
Germany  
erlmann.de

Erlmann represents productivity improvement, high stand quality and cost reducing. Our Multi Spindle Drilling and Grinding Machines can be used not only for series production but also for small series. Beside of our standard machinery program several special purpose machines have been built according to the requirements of our clients. We offer complete solutions in the range of drilling and grinding of using appropriate technology to all major friction material producers world-wide.

EXCALIBAR MINERALS LLC  
21920 Merchants Way  
Katy, TX  77449  
United States  
excalibar.com

Excalibar is a quality processor and supplier of barium sulfate/barytes and calcium carbonate. Our services include sourcing, processing, packaging and distributing high quality minerals used as fillers/extenders in the friction market.

EXPLOITER MOLYBDENUM CO LTD  
Juidian Village Song County  
Luoyang Henan 47134  
China  
ktzmy.com

Exploiter Molybdenum Co., Ltd, one of the largest producers of molybdenum disulfide, is located in the “Moly Capital” of China—Luoyang. With our local resource advantage and innovative green technologies, we are committed to supplying quality product with stability.

FRITZ WINTER EISENGIESSEREI GMBH & CO KG  
Albert-Schweitzer-Str. 15  
Stadttallendorf  D-35260  
Germany  
fritzwinter.de

Fritz Winter is the largest family-owned, independent iron foundry worldwide. Our key competence is the development and production of ambitious castings for power train, brake and hydraulic applications for the international automotive, commercial vehicle and hydraulics industry. Components from Fritz Winter are assembled worldwide in almost everything that moves.

GOLDEN CASHEW PRODUCTS PVT LTD  
69 Mailam Road Sedarapet  
Pondicherry, Pondicherry 605111  
India  
goldenproducts.in

Golden Cashew Products is an ISO 9001 certified global manufacturing company developing products derived from Cashew Nut Shell liquid. Founded in 1986, the company is headquartered in India and has grown over the years to become a reliable and largest manufacturer of CNSL based derivatives like Cardanol, Friction Particle and CNSL Resin.

GREENING INC  
19465 Mount Elliott St  
Detroit, MI  48234  
United States  
greeninginc.com

GREENING’s test equipment and testing service offerings span a wide range of vehicle and industrial brake system and driveline component applications • Brake Dynamometers • “Chase”, Compressibility (GMW15334 capable), FAST, Shear • SAE No. 2 Machine ‘wet friction’ • In-Vehicle Data Systems • ISO/IEC 17025 and GM “TIP” Accredited •ECE R90.
EXHIBITOR PROFILE

GUN EI CHEMICAL INDUSTRY CO LTD Booth 415
797-6 Shukuorui-machi
Takasaki-shi 370-0032
Japan
gunei-chemical.co.jp

American GCI Resitop, Inc. is located in Chicago, IL and will be a MILEX™ sales company starting April 2019.

HEF USA Booth 214
2015 Progress Drive
Springfield, OH 45505
United States
hefusa.net

HEF Group is a global provider of surface treatments and coatings for automotive components used in the engine, drivetrains, fuel injection systems etc. Our Liquid Nitriding treatments are utilized for several brake system applications such as brake rotors, brake-pad backing plates and brake pistons for WEAR, FRICTION & CORROSION reduction.

HI-PAD BRAKE TECHNOLOGY Booth 109
3750 Players Club Dr SE
Southport, NC 28461
United States
hi-pad.com

Manufacturer of premium ceramic, semi-metallic and low copper disc brake friction materials.

HORIBA INSTRUMENTS INC Booth 513
2890 John R Rd
Troy, MI 48083
United States
horiba.com

HORIBA is showcasing its GIANT EVO series of brake test systems for NVH and performance testing. In addition to system sales, HORIBA also offers in-house brake testing at its facilities in Troy, Michigan and Florsheim, Germany. HORIBA is a leading supplier of test systems for engines, drivelines, emissions and also provide wind tunnel balances.

IMERYS FUSED MINERALS Booth 505
4418 Prescott Rd
Nashville, TN 37204
United States
imerys.com

IMERYS minerals will display its solutions for Friction Materials. We address main industry requirements by offering tailored solutions: IMERYS offer Zirconias, Graphite, Coke, Mica and Wollastonite to control Fade and NVH, Carbon grades for electrostatic painting in Cu-free formulations, Mica and Wollastonite to reduce cracking, Zirconia for transfer film enhancement.

INDUSTRIAL MEASUREMENT SYSTEMS INC Booth 209
2760 Beverly Dr Ste 4
Aurora, IL 60502
United States
imsysinc.com

IMS specializes in ultrasonic-based instruments for composite characterization. Our ETEK 3000 measures the complete set of elastic properties of friction materials (SAE J2725) which is essential for NVH simulation. The iETEK and Rapid iETEK instruments measure the dynamic modulus non-destructively. Applications include process development, NVH studies and quality assurance.

INTERNATIONAL BRAKE INDUSTRIES INC Booth 100
1840 McCullough St
Lima, OH 45801
United States
ibilima.com

As the leading North American brake hardware supplier, International Brake Industries (IBI) specializes in the engineering and manufacturing of high quality aftermarket brake system hardware components and repair kits worldwide. IBI’s comprehensive product line, including disc and drum brake hardware kits, is sold under the Carlson Quality Brake Parts brand name and through a variety of private label programs for our customers.

ILJIN USA CORPORATION Booth 514
28055 Haggerty Rd
Novi, MI 48377
United States
iljin.com

Iljin is a global supplier of bearing and suspension/steering components for the automotive, industrial and aerospace industries. Iljin specializes in the manufacture of wheel/hub units, angular contact and tapered bearings, control arms, corner modules, ball joints, and stabilizer links. Iljin is a world leader of high quality/low cost products.

ITAPROCHIM SPA Booth 106
Via Carlo Bianconi 8/A
Milano 20139
Italy
itaprochim.it

Itaprichim, qualified leader in the Friction Market, develops and produces trade mark materials based on its own technology. Our goal has always been to provide customers with a wide range of raw materials and auxiliary goods from reliable and qualified sources. Itaprichim, your solution for raw materials see our website.
ITT FINE BLANKING
Booth 200

GOLF SPONSOR
Via delle Fabbriche 14
Vauda Canavese 10070
Italy
itt.com

ITT Fine Blanking is a backplate supplier for brake pads destined to passenger cars, vans and truck applications; the first and unique Fine Blanking company with the PDT process, Press Double Table, for reaching highest performance in terms of Quality needs, and productivity. Come to explore the New PDT World!

JIANGXI FENGZHU NEW MATERIALS TECHNOLOGY CO LTD
Booth 502

Yifeng Industrial Park Gongxi Rd Ave
Yichun City Jiangxi 201108
China
np-whisker.com

Jiangxi Fengzhu New Materials Technology Co., Ltd (hereinafter called: NP) is the professional inorganic fiber manufacturer under Chinese National policy encouragement. Materials are high-tech and eco-friendly. It was co-founded by many strong companies and universities and research institutes to form a chain that includes R&D, production and marketing with sales.

LAPINUS
Booth 409

Delfstoffenweg 2
Roermond 6045 JH
Netherlands
lapinus.com/friction

At Lapinus, we offer premium quality mineral fibres and technical support for the friction industry. Rise to friction global challenges, we continuously drive innovation for better solutions together with our customers. Rooted in sustainability, our highly biosoluble products contribute to shaping a better world for today and tomorrow.

LINK ENGINEERING COMPANY
Booth 401

BRONZE SPONSOR
43855 Plymouth Oaks Blvd.
Plymouth, MI 48170
United States
linkeng.com

See our ad on back cover

Link Engineering Company designs and manufactures precision test equipment, and provides comprehensive testing services for Transportation, Off-Highway, Industrial, and Civil Engineering. Our specialty is developing innovative custom solutions for your most complex and demanding applications—especially in the arenas of force displacement and rotational torque.

LINYI HONGTU ELECTRON CO LTD
Booth 219

B216 Rd Shuangyueyuan High-tech Area
Linyi City Shandong 27600
China
lyhongtu.com.cn

LINYI HONGTU ELECTRON CO, LTD is a leading manufacturer of brake pad wear sensor and a reliable supplier of ABS sensor and brake pad accessories in China.

MACDERMID ENTHONE INDUSTRIAL SOLUTIONS
Booth 105

Elisabeth-Selbert Ste 4
Langenfeld 40764
Germany
macdermid.com

MacDermid Enthone Industrial Solutions provides chemical solutions and materials that enhance products people use every day. Our chemical processes, materials and coatings protect and enhance components used in the automotive and other industries. Our customers rely on our unrivaled innovation and service to deliver highest performing products at lowest cost.

MAGYC SRL
Booth 503

Via Dante 41
Cocquio Trevisago
Italy
magyc.it

Magyc develops and install Industrial Quality Control Systems based on NDT Technologies: Vibration, Ultrasound, Vision. Some applications: thickness, surface, dimensions measurements; flaw, cracks, porosity, inclusions detection; incorrect heat treatments; materials characterization; 2D/3D measurements. Sectors of Application: automotive (components like disks, drums, pads and calipers etc...), sintered materials, ceramics, castings, forging, (clutch plates, valve bodies, crankcase pumps, nuts, bolts), biomedical, aerospace, railway, electrical contacts etc...

MENETA
Booth 402

BRONZE SPONSOR
39300 Country Club Dr
Farmington Hills, MI 48331
United States
meneta.dk

Meneta is a global supplier of high-quality braking components for the automotive industry. With over 2,000 employees in Europe, Asia and North America, we research, design, test and produce millions of brake shims, backplates and brake components each year. From our division in North America, we offer local support, testing, prototypes and production.
EXHIBITOR PROFILE

**MIDWEST ELASTOMERS**  
Booth 211

PO Box 412  
Wapakoneta, OH  45895  
United States  
midwestelastomers.com

MEI produces high quality recycled rubber powder (Nitrile, Butyl, SBR, Natural) materials for the friction industry. Mesh sizes range from 20 to 80 (840 to 210 microns). Smaller sizes available upon request.

**MITSUI CHEMICALS AMERICA INC**  
Booth 415

800 Westchester Ave Ste S306  
Rye Brook, NY  10573  
United States  
mitsuichemicals.com

Mitsui Chemicals America, Inc. provides specialty chemicals and high performance polymers to North and South American markets. Products are marketed in cooperation with the company’s parent, Mitsui Chemicals, Inc. and its global affiliate network. We offer MILEX™ Phenolic Resins, incorporated into superior brake pads that reduce noise, vibration and harshness.

**MORGAN ADVANCED MATERIALS**  
Booth 305

2102 Old Savannah Rd  
Augusta, GA  30906  
United States  
morganthermalceramics.com

Morgan Advanced Materials manufactures and supplies engineered fibres that increase brake pad performance stability over a wide temperature range - without increasing rotor wear or, excessive pad weight loss, or causing NVH issues.

**MORIMURA BROS. (U.S.A.) INC.**  
Booth 418

400 Kelby St Parker Plz Fl 16  
Fort Lee, NJ  07410  
United States  
morimura.co.jp/english/corporate/

TOHO MATERIAL CO.,LTD. joined SAE Brake Colloquium since 2012 with Potassium Titanate “TOFIX” for automotive friction material. With our unique and effective production process, “TOFIX” series accomplished stable quality, high friction performance and cost reduction. As a result, we have great relationship with numerous friction material manufacturers globally.

**NIAGARA BRAKE INTERNATIONAL**  
Booth 110

4708 Ontario St  
Beamsville, Ontario L0R 1B4  
Canada

Niagara Brake International is a group of automotive tier 2 companies that produce steel and phenolic disc brake caliper pistons. The group of companies include Niagara Piston Inc. located in Canada, Diemolding Corporation located in United States, Finotex FibreCast Private Limited located in India and Niagara Brake Products (Nantong) located in China.

**NTN AUTOMOTIVE CENTER**  
Booth 319

39255 W 12 Mile Rd  
Farmington Hills, MI  48331  
United States  
ntnamericas.com

NTN is a leading manufacturer of precision mechanical parts and components in the global bearing market, as well as a leading manufacturer of hub bearings and CVJ driveshaft assemblies in the automotive market.

**NUCAP INDUSTRIES INC**  
Booth 301

PLATINUM SPONSOR  
3370 Pharmacy Ave  
Toronto, Ontario M1W 3K4  
Canada  
nucap.com

See our ad on page 5

With a ZERO Failure Rate on over 1,000,000,000 units globally, the PACE Award Winning NRS™ enables the use of galvanized steel capable of standing up to the challenging elements in the braking environment resulting in a backing plate that fully answers the corrosion problem facing automotive braking today.

**OTSUKA CHEMICAL AMERICA INC**  
Booth 515

100 The Lakes Pkwy  
Griffin, GA  30224  
United States  
otsukachemical.com

TERRACESS - Advanced Titanate Products. Thanks to our unique technology to control the shape and composition of titanates, Otsuka Chemical has developed a new series of compound materials. We continue to expand usage globally as well as design new cutting-edge grades offering improved friction characteristics.
Palmer International has been developing and innovating products based on Cashew Nutshell Liquid (CNSL) for over fifty years. Our liquid and solid particle CNSL products are found in formulations from motorcycles to locomotives and everything in between. Palmer...Innovation in a Nutshell!

119 Parker Trutec is the North American subsidiary of Nihon Parkerizing (Tokyo, Japan), the world leader in metal surface improvement. The ISONITE® process improves wear, corrosion and adhesion properties on 72 million brake pad backing plates annually.

Polymec is the world’s leading manufacturer of laser vibrometers. The requirement of a noiseless brake system always poses an important challenge when developing a new vehicle. The solution to the problem is made easier today by using a combination of analytical FE methods and measuring processes like 3-D laser vibrometry.

Preferred Automotive Components wealth of knowledge in the design, development and manufacturing process provides new technology and innovative product to the industry. The patent pending QUIKrelease™ Performance Kit innovation is addressing the industry-wide issue for “Drag” and “Debris” with an added advantage for reducing SKU’s and inventory.

Procotex Corporation / Apply Carbon, is a Belgian company group specialized in chopping and milling of aramid and carbon fibers. We offer different grades of dry milled short aramid fibers suitable for friction (brake pads/linings), gaskets, coatings and many other applications.

PureForge over the last decade has developed a proprietary surface nano-technology that is applied to brake rotors to strengthen the durability of the rotors molecularly. We will share how these rotors will last up to 10x longer than normal and help the pads will last up to 5x longer. Customers are amazed by the durability of the PureForge Atomically treated rotors and how they are performing and saving them thousands of dollars.

Quartz S.r.l.s.u. is an Italian Company with Headquarter in Milan and manufacturing plants nearby Milan and in Thailand. Production is focused on Friction Materials mainly characterized by Metal Sulfides and Titanates. A R&D Team with experts in Friction and professional PhD scientists (both Chemistry and Engineering) are constantly developing new environmental friendly products.

Since 1985, at rimsa, we have been continuously developing a wide range of innovative materials which can solve the prevailing challenges of the Global Friction Industry. Our new products have been demonstrated to enhance the performance of brake pads at high temperature and are suitable for copper-free formulations.
SADECA AUTOMOTIVE SLU  Booth 210

C / . Can Clapers 25 Pol Ind Can Clapers
Barcelona  08181
Spain
sadeca.com

We develop, design and produce brake wear sensors and brake hardware for OEM and Aftermarket. With manufacturing plants in 3 continents (Barcelona, Spain, Guangzhou, China & Tangier Free Zone, Morocco), we offer the most complete range in the industry and have become a global supplier of the major brake pads and systems producers.

SHAMOKIN CARBONS  Booth 518

453 Venn Access Rd
Coal Township, PA  17866
United States
carbons.net

Established in 1933, Shamokin Carbons is dedicated to meeting the demands of the friction products market. Shamokin has every carbon and Carbon combination meeting the exacting needs of it’s customers. Synthetic graphite, amorphous graphite, petroleum cokes, metallurgical cokes and carbon fibers. SHAMOKIN is the fastest growing carbon supplier for all industrial applications. ISO certified Shamokin has every carbon option for every single application.

SHENYU MOLYBDENUM CO., LTD  Booth 108

Miaozi Town, Luanchuan, Luoyang
Luoyang 471000
China
shenyumoly.com

Shenyu Molybdenum is the subsidiary factory of China Molybdenum. China Molybdenum has molybdenum mine with 88 billion MT molybdenum ores, produce molybdenum concentrate. With stable molybdenum resources, Shenyu Molybdenum produce MoS2 with guaranteed quality.

SHOWA DENKO CARBON INC  Booth 511

GOLF SPONSOR
478 Ridge Rd
Ridgeville, SC  29472
United States
sdkc.com

Showa Denko Carbon, Inc. specializes in the production of artificial graphite particles for high performance friction materials used in OE, OES and aftermarket vehicle applications. The company uses high quality raw materials, high temperature production processes and a certified quality system to provide products with consistent and reliable material properties.

SPECIALTY LUBRICANTS CORPORATION  Booth 300

GOLF SPONSOR
8300 Corporate Park Dr
Macedonia, OH  44056
United States
speclubes.com

Specialty Lubricants Corporation is a manufacturer and private label packager of lubricants and cleaners for braking systems to lubricant and reduce NVH. We manufacture both Silicone and Synthetic greases which contain lubricating solids. These lubricants can be packaged in single use pouches for brake pad kits, wipes, or bulk containers.

STERLING FIBERS  Booth 411

5005 Sterling Way
Pace, FL  32571
United States
sterlingfibers.com

Sterling Fibers offers a variety of fibers and pulps for the Friction Material Industry. Sterling is an ISO 9001 certified company that offers a high degree of technical support. Sterling’s CFF V110-1 Acrylic Fiber prevents mix segregation and provides preforming capability equal to aramid at a much lower price.

SUMITOMO BAKELITE  Booth 515

2100 Takayanagi
Fujieda-city Shizuoka  426-0041
Japan
sumibe.co.jp

We offer phenolic resins as binder for friction materials which are used for brake linings, disc brake pads, clutch plates of transmission and others with superior heat resistance and adhesive performance.

SUPERIOR GRAPHITE CO  Booth 405

10 S Riverside Plz Ste 1470
Chicago, IL  60606
United States
superiorgraphite.com

See our ad on page 7

Superior Graphite provides unique solutions for the friction market. FormulaFX™ materials offer high purity, consistent particle size distribution, and unique physical characteristics for general and high-performance formulations. Resilient Graphitic Carbon™ (RGC™) materials are produced utilizing our high-temperature treatment/purification technology using premium raw materials offering specific morphology, high porosity, and resiliency.
TAM CERAMICS INC
Booth 217
4511 Hyde Park Blvd
Niagara Falls, NY 14305
United States
tameramics.com
TAM Ceramics manufactures high purity ceramic powders and partners with the leading brake pad manufacturers to develop advanced friction materials to help them increase market share. Braking performance and environmental impact from the braking system are two key areas where TAM provides superior materials. TAM is capable of meeting the need for sub-micron friction materials that perform in environments from passenger vehicles to high end racing and meet the need to decrease vehicle emissions.

VIBRATIONS INC
Booth 316
1250 N Lakeview Ave Ste F
Anaheim, CA 92807
United States
vibrationsinc.com
Vibrations Inc. is the exclusive North American Distributor of OptoMET Laser Doppler Vibrometers and your source for non-contact vibration measurement expertise. Our mission is to provide our customers with the best non-contact vibration measurement technology, value and support.

TAPRATH ELASTOMERS LLP
MILIN ENVIRONMENTAL INC
Booth 414
lokhandwala
305/6 Belscot Tower Link Rd
Mumbai, Maharashtra 400053
India
taprath.com
Taprath Elastomers LLP specializes in producing NBR & SBR Powders and Engineered Mineral fibres. The established manufacturer competes on a global stage, and in North America partners with experienced, long-standing distributor Milin Environmental. Our companies work together to offer the brake & friction industry proven materials & reliable, knowledgeable support.

WINHERE BRAKE PARTS INC
Booth 500
1331 Schiferl Rd
Bartlett, IL 60103
United States
winherebrake.com
Founded in 1996, Winhere is the largest professional manufacturer of brake discs and drums from China; National Green Manufacturer winner in 2018. Winhere produces and ships 48 million units of brake discs and drums annually for OEM and aftermarket globally.

TRELLEBORG SEALING SOLUTIONS
Booth 315
GOLF SPONSOR
15701 Centennial Dr
Northville, MI 48168
United States
rubore.com
Trelleborg Sealing Solutions (TSS), Kalmar is one of the world’s leading manufacturers of noise damping shims/insulators for disc brake pads. TSS-Kalmar manufactures a wide range of noise damping shims / insulators that are used when endurance against thermal, chemical and mechanical stress is required. This is combined with out-standing sound damping, sealing, vibration insulation, compressibility and bonding capacity.

WOLVERINE ADVANCED MATERIALS
Booth 308
SILVER SPONSOR
5850 Mercury Dr Ste 250
Dearborn, MI 48126
United States
wamglobal.com
Wolverine Advanced Materials is a leading developer and manufacturer of high-performance materials. Our core competency is in performance-critical, specialty elastomer-coated metals that offer damping and sealing solutions in the automotive brake, NVH, and sealing industries. Extensive industry knowledge and innovative materials have made Wolverine a desired and trusted global supplier for over 80 years.

UTIL GROUP
Booth 302
SILVER SPONSOR
270 Spinnaker Way
Concord, Ontario L4K 4W1
Canada
utilgroup.com
UTIL Group is the leading global source for integrally molded backing plates, brake shoes, hardware, and shims. With more than 1,400 employees distributed across four plants that supply products and services worldwide, UTIL prides itself on complying with the highest quality and efficiency standards, while fully meeting all customer expectations.

XINLIDA AUTO PARTS LLC
Booth 318
Xinlida Auto Parts is a leading global manufacturer and supplier of high quality automotive brake system components. Product lines include full coverage for disc brake shims, attaching hardware, disc and drum brake kits and caliper abutment clips. Xinlida is persistent in the pursuit of quality, excellence and continuous improvement.
## AD INDEX

<table>
<thead>
<tr>
<th>Company</th>
<th>Booth#</th>
<th>Page</th>
<th>Web Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Itaprochim SRL</td>
<td>106</td>
<td>Inside Front Cover</td>
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</tr>
<tr>
<td>LINK Engineering Company</td>
<td>401</td>
<td>Back Cover</td>
<td><a href="http://www.linkeng.com">www.linkeng.com</a></td>
</tr>
<tr>
<td>NUCAP Industries, Inc.</td>
<td>301</td>
<td>5</td>
<td><a href="http://www.nrsbrakes.com">www.nrsbrakes.com</a></td>
</tr>
<tr>
<td>Superior Graphite</td>
<td>405</td>
<td>7</td>
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