Celstran® LFRT
Proven Performance for Automotive Structural Parts

The definition of lightweight is changing every day, and the demand for materials that provide low cost and superior performance has never been greater. Celstran® long fiber reinforced thermoplastics (LFRT) from Ticona deliver:

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- Higher modulus at elevated temperatures

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8040 Dixie Highway, Florence, KY 41042

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Innovation and Sustainability
Yesterday—Today—Tomorrow

PPG began its strategic partnership with the automotive industry in the 1920s. We understand the cost drivers of automakers and their design engineers. PPG Fiber Glass for automotive applications not only enables better vehicle fuel efficiency with its lightweight feature, it reduces the overall cost of vehicle components by making it possible to incorporate multiple components into a single structure—eliminating brackets, fasteners and welding operations. TUFROV® rovings are tailor-made reinforcements for resin-specific applications. With sizing flexibility, optimal balances of dry strength and faster fiber resin wetting with higher compound throughput are achieved with every process. PPG’s comprehensive line of ChopVantage® chopped strands offer various high degrees of fatigue and heat resistance and are designed to reinforce a wide range of applications in polyamide and other resin systems. Global availability of our fiber glass products and technical support make PPG your strategic partner for today and tomorrow. PPG Fiber Glass is your total solution and we’re bringing innovation to the surface.

Visit www/ppgfiberglass.com to learn more.
On behalf of the Automotive and Composites Divisions of the Society of Plastics Engineers International, I bid you welcome to the 11th-annual Automotive Composites Conference and Exhibition. This year’s theme is “Driving Design.” As the conference enters its second decade, we are excited to present to you the world’s leading automotive composites forum and we again have attracted presenters and attendees from around the globe.

This year we have extended our conference to a three-day forum as the automotive markets continue their recovery. Our 2011 program features a comprehensive number of papers and presentations and our focus continues to be on utilization of composites in automotive and transportation.

This year we have:

• 56 peer reviewed technical papers plus 9 keynote speakers from industry leaders;
• Panel discussions on The Role of Composites in Battery Cases & Trays for Fleet Electrification and Measuring the Sustainability Proposition of Composites;
• PPG – SPE Graduate and Undergraduate Poster Competition;
• ACCE Best Technical Paper Awards;
• A wonderful array of exhibitors and sponsors;
• Our annual cocktail reception sponsored by American Composites Manufacturers Association (ACMA) – Automotive Composites Alliance (ACA);
• A presentation on new styrene regulations and their ramifications on industry by the American Composites Manufacturers Association (ACMA);
• And, just as importantly, a small friendly environment that fosters the networking with suppliers, colleagues, and customers that have made this event a success for over a decade.

It is an honor to be the chair for the 2011 ACCE and to have worked with the planning committee as a speaker, then a member, and now leading it. The planning committee for the ACCE is a volunteer group of industry experts dedicated to the growth of composites and passionate about the automotive business. It is my humble responsibility to be the face of this great group of professionals from both the Automotive and Composites Divisions of SPE. Without the year-round efforts of this committee, we would not continue to present the scope and quality of conference that the ACCE has come to embody.

I also want to personally thank all our authors and presenters, keynote speakers, panelists, sponsors, and attendees. Please take advantage of this unique composites conference and the opportunities it presents to help you in your quest for greater utilization of composites!

Enjoy the conference and please contact any of our planning committee members if you have questions or feedback for us.

Kind Regards,

Creig Bowland

Creig Bowland
Chair, SPE Automotive Composites Conference and Exhibition 2011
PPG Industries
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nippanirao@aol.com
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PANEL DISCUSSION
PANEL 1: BATTERIES
Drew Winter, Moderator
Ward’s AutoWorld
Jim Dutchik
Asahi Kasei North America
Frank Henning
Fraunhofer Institute for Chemical Technology
Kestutis Sonta
General Motors Co.
Joe Bodary
Continental Structural Plastics

PANEL 2: SUSTAINABILITY
Jeff Sloan, Moderator
CompositesWorld.com
Shristy Bashyal
University of Missouri
Ashish Diwanji
Owens Corning
Antony Dodworth
Dedworth Design
Mark Voss
General Motors Co.
C. David Warren
Oak Ridge National Laboratory
Jaap van der Woude
PPG Industries
<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>7:00–8:15</td>
<td>REGISTRATION - COFFEE IN MEZZANINE</td>
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<td>RIBBON-CUTTING CEREMONY - EXHIBITS OPEN</td>
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<td>CONTINENTAL BREAKFAST SERVED - BALLROOM</td>
</tr>
<tr>
<td>8:15–8:45</td>
<td>OPENING REMARKS (Including Best Paper Awards &amp; Student Scholarship Announcements) - Creig Bowland, 2011 SPE ACCE Chair, PPG Industries</td>
</tr>
<tr>
<td>8:45–9:00</td>
<td>COFFEE BREAK &amp; EXHIBITS - BALLROOM</td>
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**TUESDAY, SEPT 13**

<table>
<thead>
<tr>
<th>Time</th>
<th>Location</th>
<th>Event</th>
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<tbody>
<tr>
<td>9:00–9:30</td>
<td>IN AUDITORIUM</td>
<td>ENABLING TECHNOLOGIES - PART 1: New Process Options</td>
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<tr>
<td></td>
<td></td>
<td>Raman Chaudhari</td>
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<td>Fraunhofer Institut für Chemische Technologie</td>
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<td></td>
<td></td>
<td>High Pressure Compression RTM - A New Process for Manufacturing High Volume Continuous Fiber Reinforced Composites</td>
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<tr>
<td>9:30–10:00</td>
<td>IN AMPHITHEATER 101</td>
<td>ADVANCES IN THERMOSET COMPOSITES - PART 1: SMC &amp; BMC</td>
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<tr>
<td></td>
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<td>Marcel Schutte</td>
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<td>DSM Coating Resins</td>
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<td>Powder In-Mould Coating as a Superior Finishing Solution for SMC in Automotive Applications</td>
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<td><em>Paper Previously Presented at the European Coatings Conference</em></td>
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<tr>
<td>10:00–10:30</td>
<td>IN AMPHITHEATER 102</td>
<td>BIO &amp; NATURAL FIBER COMPOSITES</td>
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<td>Andre Bendo</td>
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<td>BASF Corp.</td>
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<td>Material Characterization of Natural Fiber – Acrylic Thermoset Composites</td>
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<tr>
<td>10:30–11:00</td>
<td></td>
<td>Process, Material &amp; Part Characterization of the Innovative Direct SMC Process 2008 SPE ACCE Scholarship Award Winner</td>
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<td></td>
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<td>Koichi Akiyama</td>
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<td>Mitsubishi Rayon Co., Ltd.</td>
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<td>Development of PCM (Prepreg Compression Molding) Technology</td>
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<td>10:30–11:00</td>
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<td>Cedric Ball</td>
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<td>Bulk Molding Compounds, Inc.</td>
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<td>Bulk Molding Compound Use in Automotive Fuel Cell Applications</td>
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<td>11:00–11:30</td>
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<td>KEYNOTE SPEAKER John Schweitzer, Senior Director-Government Affairs, American Composites Manufacturers Association, NTP's Cancer Assessment for Styrene – Science, Policy and Implications</td>
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<tr>
<td>11:30–12:30</td>
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<td>LUNCH &amp; EXHIBITS - BALLROOM</td>
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<td>12:30–1:00</td>
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<td>KEYNOTE SPEAKER C. David Warren, Program Manager-Transportation Materials &amp; Carbon Fiber, Oak Ridge National Laboratory Lower Cost Carbon Fiber in High Volumes for 21st-Century Industries – The Obstacles to Getting There</td>
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<td>1:00–1:15</td>
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<td>COFFEE BREAK &amp; EXHIBITS - BALLROOM</td>
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<td>1:15–1:45</td>
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<td>ENABLING TECHNOLOGIES - PART 2: Process Control &amp; Secondary Finishing</td>
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<td>Tom Trexler</td>
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<td>Signature Control Engineering LLC</td>
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<td>Dielectric Sensing Technology: Key to Productivity &amp; Product Consistency</td>
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<td>1:45–2:15</td>
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<td>ADVANCES IN THERMOSET COMPOSITES - PART 2: Adhesives</td>
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<td>Jie Feng</td>
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<td>The Dow Chemical Co.</td>
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<td>Analysis of Adhesive Geometric Effect on Fracture Behavior in Applying Rubbery Filled Epoxy Materials</td>
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<td>2:15–2:45</td>
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<td>VIRTUAL PROTOTYPING &amp; TESTING OF COMPOSITES - PART 1: Fiber Orientation</td>
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<td>Tim Latimer</td>
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<td>University of Tulsa</td>
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<td>A Method for Characterizing Fiber length Distribution in Random Fiber Composites</td>
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<td>2:45–3:15</td>
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<td>Mark Handelsman</td>
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<td>KMT Robotic Solutions</td>
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<td>Robotic Trimming, Cutting and Sanding of Carbon Fiber Body Structures</td>
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<td>3:15–3:30</td>
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<td>COFFEE BREAK &amp; EXHIBITS - BALLROOM</td>
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<td>3:30–4:30</td>
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<td>KEYNOTE SPEAKER Antony Dodworth, Managing Director, Dodworth Design, Stiffer is Better: Lessons Learned in Composites Design of Lightweight Automotive Structures</td>
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<td>4:30–6:00</td>
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<td>PANEL DISCUSSION The Role of Composites in Battery Cases &amp; Trays for Fleet Electrification</td>
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<td>MODERATOR: Drew Winter, Ward’s AutoWorld</td>
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<td>PANELISTS: Jim Dutchik, Asahi Kasei, Frank Henning, Fraunhofer ICM, Kestutis Sonta, General Motors Co., Joe Bodary, Continental Structural Plastics</td>
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<td>6:30–8:00</td>
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<td>COCKTAIL RECEPTION Sponsored by American Composites Manufacturers Association (ACMA) – Automotive Composites Alliance (ACA)</td>
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</tbody>
</table>
7:00–8:00  REGISTRATION / CONTINENTAL BREAKFAST SERVED & EXHIBITS - BALLROOM

8:00–8:15  OPENING REMARKS (Including PPG-SPE Undergraduate & Graduate Poster Competition Awards) Creig Bowland, 2011 SPE ACCE Chair, PPG Industries

8:15–8:30  COFFEE BREAK & EXHIBITS - BALLROOM

IN AUDITORIUM

8:30–9:00  FINALIZING THE DESIGN & DEVELOPMENT OF A STRUCTURAL COMPOSITE UNDERBODY - PART 1:

Libby Berger
General Motors Co. / USCAR
Program Summary of the ACC Automotive Composites Underbody

ADVANCES IN THERMOPLASTIC COMPOSITES - PART 1: Enhancing Polypropylene

Scott Miller
Dow Corning Corp.
Closing the Gap Between Polypropylene and Polyamide Composites with New Silane Grafting Technology from Dow Corning

VIRTUAL PROTYPING & TESTING OF COMPOSITES - PART 2: Fiber Orientation

Marios Lambi
BASF Corp.
Predicting Performance of Thermoplastic Composites Taking into Account the Fiber Orientation Effects Utilizing ULTRASIM™ Technology – Part 1: Methodology

9:00–9:30  Charles Knakal
USCAR
Manufacturing Scenarios & Challenges with a Fabric SMC Automotive Underbody

Yan Jin
SINOPEC Beijing Research Institute of Chemical Industry
Analysis of Polypropylene Odor Based on Electronic Olfactory System

Marios Lambi
BASF Corp.
Predicting Performance of Thermoplastic Composites Taking into Account the Fiber Orientation Effects Utilizing ULTRASIM™ Technology – Part 2: Case Studies

9:30–10:00  Libby Berger
General Motors Co. / USCAR
Material Properties of a Fabric Sheet Molding Compound for a Structural Composite Underbody

Joseph George
Quadrant Plastic Composites
Lightweight Design of Structural Parts with Thermoplastic Composites

Robert Sherman
RTP Company
Injection Molding Fiber Orientation, Property Predictions, and Failure Analysis

10:00–10:15  COFFEE BREAK & EXHIBITS - BALLROOM

IN AMPHITHEATER 101

10:15–10:45  FINALIZING THE DESIGN & DEVELOPMENT OF A STRUCTURAL COMPOSITE UNDERBODY - PART 2:

Justin Hunt
AET Integration Inc. / USCAR
Fatigue Performance of SMC Composite Material under Different Environmental Damage & Temperature Conditions

ADVANCES IN THERMOPLASTIC COMPOSITES - PART 2: Enhancing Polypropylene

Creig Bowland
PPG industries, Inc.
A Formulation Study of Long Fiber Thermoplastic Polypropylene (Part 3): Mechanical Properties of PP DLFT Composites

VIRTUAL PROTYPING & TESTING OF COMPOSITES - PART 3: Toward Mainstream Automotive

Rani Richardson
Dassault Systemes
CAD: Composites Are Different - Moving Beyond Yesterday’s CAD Tools to Accelerate Adoption in Mass-Produced Autos

10:45–11:15  Hannes Fuchs
Multimatic Engineering / USCAR
Status of the Composite Underbody Component & Assembly Structural Test-Analysis Correlation 2011 SPE ACCE Best Paper Award Winner

K.B. Thattaiparthasarthy
University of Alabama at Birmingham
Colored Inorganic Pigmented Long Fiber Thermoplastics

Richard Schaake
SKF Engineering & Research Centre
Understanding of Aerospace Composite Design Principles for Structural Fittings

11:15–11:45  John Klein
Asahi Kasei Plastics North America
High Performance Engineered Polypropylene Compounds for High Temperature Automotive Under-the-Hood Applications

James Salerno
Plasan Carbon Composites
Implementation of Advanced Composite Design Software and Practices

11:45–12:45  LUNCH & EXHIBITS - BALLROOM

12:45–1:15  KEYNOTE SPEAKER Chuck Kazmierski, Program Manager, Lucintel, Growth Opportunities in Global Composites Market 2011–2016

1:15–1:45  KEYNOTE SPEAKER Patrice Sinthon, Director-Marketing & Sales, JEC Group, Main Trends & Dynamics of the Worldwide Composites Industry

1:45–2:00  COFFEE BREAK & EXHIBITS - BALLROOM
IN AUDITORIUM  |  IN AMPHITHEATER 101  |  IN AMPHITHEATER 102
--- | --- | ---
**ADVANCES IN THERMOPLASTIC COMPOSITES - PART 3:** New Options for Improving Mechanicals  |  [Kipp Grumm, BASF](#)  |  C.H. Choi  
Hyundai Motor Co.  
Recent Thermoplastic Composites for Automotive Applications  |  [Roger Assaker](#)  
e-xstream engineering  
DIGIMAT for Continuous Fiber Reinforced Composites  

2:00–2:30

**Thermoplastic Overmolded Continuous Fiber Structures**  |  [Amit Kulkarni, Faurecia](#)  |  

2:30–3:00

**Recent Thermoplastic Composites for Automotive Applications**  |  [Thermoplastic Overmolded Continuous Fiber Structures](#)  |  [Marcia Kurcz](#)  
Polyscope Polymers B.V.  
Automotive Sunroof Systems & Frames in Xiran® SMA/ABS  |  [Michael Parrott](#)  
e-xstream engineering  
Multi-Scale Modeling of Fatigue of Fiber Reinforced Plastics with DIGIMAT  

3:00–3:30

**Integration of features into parts made from thermoplastic, unidirectional tape – overview and case study 2010 SPE ACCE Scholarship Award Winner**  |  [Benjamin Hangs](#)  
Fraunhofer Institut für Chemische Technologie  
Local Continuous Fibre-Reinforcement – Tailored Injection Moulding >> Lightweight Potential for Injection Moulded Parts  |  [Thomas Russell](#)  
Allied Composite Technologies LLC  
Thermoplastic Composite Structural Strut  |  [Paul Deslauriers](#)  
Multimatic Engineering  
Finite Element Modeling of Bond-Line Read-Through in Composite Automotive Body Panels Subject to Elevated Temperature Cure  

3:30–3:45

[COFFEE BREAK & EXHIBITS - BALLROOM](#)  |  |  

3:45–4:15  |  [KEYNOTE SPEAKER](#)  
Nathan Armstrong, President & Director, Motive Industries, Return of the Small Car Maker  |  

4:15–4:45  |  [KEYNOTE SPEAKER](#)  
Ashish Diwanji, Vice-President of Innovation, Owens Corning, Winning with Composites in a World Seeking Sustainable Solutions  |  

4:45–6:15

**PANEL DISCUSSION Measuring the Sustainability Proposition of Composites**  |  [Jeff Sloan](#)  
CompositesWorld.com  
MODERATOR: Jeff Sloan, CompositesWorld.com  
PANELISTS: Shristy Bashyal, University of Missouri; Ashish Diwanji, Owens Corning; Antony Dodworth, Dodworth Design; Mark Voss, General Motors Co.; C. David Warren, Oak Ridge National Laboratory; Jaap van der Woude, PPG Industries  

7:30–8:30  |  CONTINENTAL BREAKFAST SERVED & EXHIBITS - BALLROOM  |  

8:30–9:00

**NANOCOMPOSITES**  |  [Martin Bureau](#)  
National Research Council Canada  
Selective Compatibilization for Stiffer, High Impact TPO/Clay Nanocomposites  |  

9:00–9:30  |  [Steve Mok](#)  
DuPont Automotive  
Superior Resistance to Thermo-Oxidative & Chemical Degradation in Polyamides & Polyphthalamides  |  

9:30–10:00  |  [Charlie Costello](#)  
Ticona Engineering Polymers  
Thermoplastics for High-Temperature Composite Processes & Applications  |  

10:00–10:30  |  [COFFEE BREAK & EXHIBITS - BALLROOM](#)  |  

10:30–11:00  |  [KEYNOTE SPEAKER](#)  
David Lashmore, Vice President R&D, Nanocomp Technologies, Inc., Carbon Nanotube Composites Fabricated from Multwall Carbon Nanotube (MWNT) Mat  |  

11:00–11:30  |  [KEYNOTE SPEAKER](#)  
Mark Voss, Lead Composites Engineer, General Motors Co., GM’s Lightweighting Strategy for Composites  |  

11:30–11:45  |  [CLOSING REMARKS](#)  
Creig Bowland, 2011 SPE ACCE Chair  |  

11:45–1:00  |  [LUNCH & EXHIBITS - BALLROOM](#)  |  

1:00  |  CONFERENCE ADJOURNS  |  

1:30–4:30  |  [OFFSITE PLANT TOUR AT ROMEO RIM](#)  |  

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**THURSDAY, SEPT 15**

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SPE ACCE 2001, Sept. 19-20:
43 presentations
Larry Drzal
Michigan State University
Jay Raisoni
Delphi Automotive

SPE ACCE 2002, Sept. 12-13:
1 keynote, 53 presentations, 1 panel
Larry Drzal
Michigan State University
Jay Raisoni
Delphi Automotive

SPE ACCE 2007, Sept. 11-13:
7 keynotes, 68 presentations, 2 panels
Frank Henning,
Fraunhofer Institut für Chemische Technologie
Peggy Malnati
Malnati & Associates

SPE ACCE 2008, Sept. 16-18:
9 keynotes, 61 presentations, 1 panel
Antoine Rios
The Madison Group
Fred Buck
Commercial Vehicle Group
A Tribute

Technical Chairs & Programs Over the Years

SPE ACCE 2009, Sept. 15-16:
7 keynotes, 46 presentations

Dev Barpanda  
Dow Chemical

Ellen Lackey  
University of Mississippi

SPE ACCE 2004, Sept. 14-15:
6 keynotes, 36 presentations, 1 panel

Michael Connolly  
Huntsman Polyurethanes

Enamul Haque  
OC Automotive

SPE ACCE 2003: Sept. 9-10:
4 keynotes, 51 presentations

Michael Connolly  
Huntsman Polyurethanes

Maria Ciliberti
Composites Technology Corp.

SPE ACCE 2009, Sept. 15-16:
7 keynotes, 51 presentations, 1 panel

Dev Barpanda  
Dow Chemical

Creig Bowland  
PPG Industries
SPE ACCE 2005, Sept. 12-14: 6 keynotes, 47 presentations, 2 panels
Brian Grosser, SPE
Jackie Rehkopf, Ford Motor Co.

SPE ACCE 2006, Sept. 12-14: 8 keynotes, 60 presentations, 3 panels
Brian Grosser, DieTech North America
Jackie Rehkopf, Exponent, Inc.

SPE ACCE 2011, Sept. 13-15: 9 keynotes, 56 presentations, 2 panels
Bob Egbers, COMUSA
Shashank Karnik, Rain Bird Corp.
Be the first to know as you learn from and network with industry leaders at this business development conference featuring more than 20 timely market and technical presentations.

Pre-Conference Market Outlook Seminar - December 5

KEYNOTE PRESENTATION: Airbus Composites Innovation: Current and Future Perspectives, Bruno Beral, Head of Structures Research and Technologies, Airbus

TO LEARN MORE OR REGISTER VISIT: compositesworld.com/cf
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We have better solutions for making cars lighter

See you at SPE ACCE in Troy, Michigan
September 13–15, 2011

Lower density SMC systems with AOC’s Atyl®
Tough Class A technology delivers state-of-the-art surface quality and finish attributes.

<table>
<thead>
<tr>
<th>SMC Density</th>
<th>Specific Gravity</th>
<th>% Mass Reduction</th>
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<tbody>
<tr>
<td>Standard</td>
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<tr>
<td>Medium</td>
<td>1.6</td>
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<tr>
<td>Low</td>
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Polystrand, an industry leader in thermoplastic composites, has broken ground on a new 120,000 square foot facility in Denver, Colorado. Completion for this factory is slated for March 1st, 2012. It will house a new production line capable of manufacturing 10 million pounds of thermoplastic tape.

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Romeo RIM is the leader in the development and processing of reaction injection molding technology for the mass transit, agricultural, construction, heavy truck, specialty automotive, and leisure markets. With nearly 30 years experience, Romeo RIM continues to innovate and provide customers with material solutions that will meet their requirements for performance and appearance.

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The world’s largest long-fiber injection (LFI) press in operation
A new in-mold painted LFI process producing Class A LFI parts right out of the tool
ENABLING TECHNOLOGIES – PART 1: New Process Options

Raman Chaudhari, Fraunhofer Institut für Chemische Technologie

*High Pressure Compression RTM - A New Process for Manufacturing High Volume Continuous Fiber Reinforced Composites*

The HP-CRTM process is a combination of resin transfer molding (RTM) and compression molding. The objective of the proposed study was to investigate the effect of parameters such as mold opening distance and fiber orientation on the quality of the HP-CRTM components. The influence of these process variables on the component quality and the mechanical properties were analyzed. The study proved the applicability of the HP-CRTM process for high-volume manufacturing of RTM components.

Koichi Akiyama, Mitsubishi Rayon Co., Ltd.

*Development of PCM (Prepreg Compression Molding) Technology*

A high-cycle CFRP manufacturing process named PCM (Prepreg Compression Molding) has been developed. Newly developed fast curing prepreg is suitable for compression molding and cures in 3 minutes. Several application development studies suggested PCM is a feasible process to be used for high-volume production.

Tobias Potyra, Fraunhofer Institut für Chemische Technologie

*Process, Material & Part Characterization of the Innovative Direct SMC Process 2008 SPE ACCE Scholarship Award Winner*

The direct processing technology for thermoset compression moulded composites parts offers new degrees of freedom in the manufacturing step. An insight into the correlation between process parameters and the resulting mechanical characteristics of the material is given. Based on a design of experiments (DOE) study, crucial parameters have been varied in order to identify their quantitative effect on material properties.

Paul Condeelis, Romeo RIM, Inc.

*Process & Equipment Breakthroughs in Long-Fiber Injection (LFI) Technology*

When designing new components, the demand for materials that provide property flexibility, durability, low weight, and low cost options continues to be high. LFI is one of the materials that more engineers are selecting for applications, because it meets these criteria. With the newest breakthroughs in process and equipment capabilities, the ability to use LFI for larger and more complex parts continues to increase while providing more options for engineers to meet demanding performance requirements.

ENABLING TECHNOLOGIES – PART 2: Process Control & Secondary Finishing

Tom Trexler, Signature Control Engineering LLC

*Dielectric Sensing Technology: Key to Productivity & Product Consistency*

Breakthroughs in dielectric sensor design have resulted in the development of durable in-mold sensors that can operate on the production floor and in the laboratory. Thermoset molders can now “see” changes in flow and cure inside their production tools, and in spiral-flow tools allowing automatic “real-time” adjustments for process variation and enabling significant gains in productivity and quality.

Duane Snider, Flow International Corp.

*Precision Waterjet Cutting in the Composites Industry Utilizing Robots for High Quality Accurate Machining*

Six-axis, articulated-arm robots and 5-axis Gantry robots are commonly deployed with plain waterjets for many applications, especially in the automotive industry. The focus is on extending the use of these robots to abrasive waterjets and for a much wider range of applications, primarily in the composites market. This paper discusses the cutting process of the ultra-high-pressure waterjet and its technical advantages over conventional mechanical cutting tools.

Mark Handelsman, KMT Robotic Solutions

*Robotic Trimming, Cutting & Sanding of Carbon Fiber Body Structures*

Any automotive OEM or tier 1 supplier who is planning to either ramp up or begin higher volume production of carbon fiber body structures will need to address the unique production challenges of these materials. One of the most significant is how to handle cutting and other material-removal processes. This paper steps through the experience from the automation of carbon fiber automotive components and critical lessons learned on the best approaches to process CFRP panels and why. Next, the paper discusses how the lead companies are preparing for the production of carbon fiber body structures and shares some insights from their experience.
**ADVANCES IN THERMOSET COMPOSITES – PART 1: SMC & BMC**

Marcel Schutte, DSM Coating Resins

*Paper Previously Presented at the European Coatings Conference*

Powder In-Mould Coating as a Superior Finishing Solution for SMC in Automotive Applications

New controlled chemistry now enables automotive-grade powder in-mould coatings, providing an efficient solution for interior and exterior applications. The durable coating also has a lower ECO footprint, plus good barrier and surface properties.

**ADVANCES IN THERMOSET COMPOSITES – PART 2: Adhesives**

Jie Feng, The Dow Chemical Co.

Analysis of Adhesive Geometric Effect on Fracture Behavior in Applying Rubber Filled Epoxy Materials

This study investigates the geometric effect of applying rubber-toughened epoxy as an adhesive. Using a combination of experimental and predictive modeling approaches, the effect of bonding layer thickness variation is evaluated for rubber-filled epoxy.

**BIO & NATURAL FIBER COMPOSITES**

Andre Bendo, BASF Corp.

Material Characterization of Natural Fiber – Acrylic Thermoset Composites

The pressures facing many industries to move to lighter weight parts and more environmentally friendly materials of construction and processing methods has risen considerably over the last decade. Meeting those goals without sacrificing performance or durability remains a significant challenge and limits the adoption of many technologies. This presentation will discuss a new enabling technology capable of producing natural fiber composites with acrylic-based thermosets that deliver high mechanical performance and address drivers for mass reduction and environmental issues.

**BIO & NATURAL FIBER COMPOSITES**

Victor Bravo, National Research Council Canada

Direct Long Biofibre Thermoplastic Composites for Automotive, Aerospace & Transportation Industries

This paper deals with the challenges of using biofibres as reinforcing materials for thermoplastic resins. The research work involved the use of short flax fibres in a continuous-compounding process and flax fibre rovings in a direct-long fibre thermoplastic (D-LFT) process. Experiments using commercial flax rovings (continuous fibres) on an industrial large-scale D-LFT line showed the viability of the processing technique.
Robert Joyce, Innovative Plastics & Molding

*Fluid Assist Injected Molded Parts with FibreTuff – a Natural Fiber Composite*

This presentation discusses the advantages of fluid-assist technology with a new biopolymer compound, “FibreTuff,” as well as the applications where this new biopolymer technology helps increase performance and functionality while lowering costs to produce a molded part.

Rick Bell, DuPont Automotive

*Commercial Applications of Bio-Based Polymers in Automotive*

Recent new product developments have expanded the functional performance of bio-based polymers, allowing their use in some of the most demanding automotive applications for high temperature, chemical resistance, and structural properties. Commercial applications include glass-reinforced polyester and nylon for structural and underhood components. While these polymers provide significant environmental benefits, their unique properties have also provided cost savings. This presentation will provide an overview of DuPont’s bio-based technology platform, polymer properties, and applications in the automotive sector.

Francesco DeLeo, University of Washington

*Crashworthiness Energy Absorption of Carbon Fiber Composites: Experiment and Simulation*

2010 SPE ACCE Scholarship Award Winner
2011 SPE ACCE Best Paper Award Winner

The merits and weaknesses of a progressive-failure composite-material model, MAT54, of a commercially available explicit finite-element solver, LS-DYNA, are highlighted through single-element investigations. Then, the suitability of MAT54 to simulate the quasi-static crushing of a composite specimen is evaluated. Through extensive calibration by trial and error, the crushing behavior of a semi-circular sinusoid specimen comprised of carbon fiber / epoxy unidirectional prepreg tape is properly simulated. The study is extended to five different geometries in order to evaluate the effect of geometric features on crush behavior, both from an experimental and numerical standpoint. Finally an energy-absorbing composite sandwich structural concept, comprised of a deep honeycomb core with carbon fiber / epoxy facesheets, subject to through-thickness crushing and penetration, is considered.

Syed Mazahir, Virginia Tech

*Simulation of Folgar-Tucker Orientation Model with a Semi-Circular Advancing Front Geometry*

The standard method of simulating fiber orientation in injection molding flows uses Hele Shaw approximation with the Folgar-Tucker model for orientation, ignoring the important effects of fountain flow in the frontal region. In this work, the effects of the fountain-flow region were assessed by including a simplified semi-circular cap to the finite-element mesh. We also looked at combinations of inlet conditions for orientation and the model parameters to determine their compatibility with the geometrical simplification used to describe the front.

Francesco DeLeo, University of Washington

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Kevin Meyer, Virginia Tech

*Progress on Simulating Orientation of Long Glass Fibers in Composites Molding*

This presentation offers a novel method of predicting fiber orientation in simple and complex flow fields based entirely on rheological methods. Fiber-orientation predictions are made with the classical Folgar-Tucker model along with a flexible fiber model and compared to experimental measurements.

Syed Mazahir, Virginia Tech

*Simulation of Folgar-Tucker Orientation Model with a Semi-Circular Advancing Front Geometry*

The standard method of simulating fiber orientation in injection molding flows uses Hele Shaw approximation with the Folgar-Tucker model for orientation, ignoring the important effects of fountain flow in the frontal region. In this work, the effects of the fountain-flow region were assessed by including a simplified semi-circular cap to the finite-element mesh. We also looked at combinations of inlet conditions for orientation and the model parameters to determine their compatibility with the geometrical simplification used to describe the front.

Marios Lambi, BASF Corp.

*Predicting Performance of Thermoplastic Composites Taking into Account the Fiber Orientation Effects Utilizing ULTRASIM™ Technology – Part I: Methodology*

A major advantage of plastic part design is the high degree of flexibility to adjust sectional properties such as wall thickness and shape, but that same flexibility also increases design complexity, making analysis predictions quite difficult. The dependency of performance to processing parameters, and thus to fiber orientation effects is highly dependent on inherent part properties such as geometry and thickness. The ULTRASIM™ methodology presented here can accurately simulate and predict part performance taking into account the fiber orientation effects for the particular plastic material under consideration.
Marios Lambi, BASF Corp.

Predicting Performance of Thermoplastic Composites Taking into Account the Fiber Orientation Effects Utilizing ULTRASIM™ Technology – Part 2: Case Studies

The ULTRASIM™ methodology, already presented in Part I, can accurately simulate and predict part performance, taking into account the fiber orientation effects for the particular plastic material under consideration. Therefore, using finite-element structural analysis while accounting for anisotropic behavior of plastic materials yields very accurate predictions where the specific failure – whether tensile or compressive in nature – of the material is also taken into account. In this paper, various case studies will be presented to showcase the accuracy and predictive capabilities of this unique technology.

Robert Sherman, RTP Company

Injection Molding Fiber Orientation, Property Predictions, and Failure Analysis

This presentation reviews the principal driving factors that determine fiber orientation in structural injection moldings and how that influences the properties that these materials exhibit in actual part designs. It also presents an approach utilizing current predictive technologies to better predict at what loads and how part designs will fail.

VIRTUAL PROTOTYPING & TESTING OF COMPOSITES – PART 3: Toward Mainstream Automotive

Rani Richardson, Dassault Systèmes

CAD: Composites Are Different - Moving Beyond Yesterday’s CAD Tools to Accelerate Adoption in Mass-Produced Autos

Most existing computer-aided design (CAD) software solutions were originally intended for use with metal and plastic parts of far less complexity than today’s multi-layered composites. They offer no facility for keeping track of the laminate and composites properties, forcing the engineer to track this information manually in a spreadsheet. To reap the benefits of wide-spread composites use, the industry must adapt its processes and tools accordingly. Attendees of this presentation will learn how tight collaboration between design, analysis, and manufacturing teams will enable automotive OEMs, as well as suppliers to implement a seamless process to develop high-quality composites designs and bring them to market faster and at a lower cost.

Richard Schaake, SKF Engineering & Research Centre

Understanding of Aerospace Composite Design Principles for Structural Fittings

To design composites for weight reduction in structural components, aerospace know-how on design principles can be used. However, automotive volumes and functional needs are different from those of the aerospace industry, and the know-how needs to be translated to know-why. Simple mechanical models were used to generate this understanding and to provide a starting point for further investigations.

James Salerno, Plasan Carbon Composites

Implementation of Advanced Composite Design Software and Practices

An evaluation of current computer modeling and simulation techniques and their integration with composite design practices in the automotive industry is underway. This presentation includes discussion of the tools available to R&D, product development, prototyping / PPAP, and manufacturing engineering, and the potential benefits that result from their use.

VIRTUAL PROTOTYPING & TESTING OF COMPOSITES – PART 4: Modeling

Roger Assaker, e-Xstream engineering

DIGIMAT for Continuous Fiber Reinforced Composites

Predictive simulations are key to the development of composite materials, as well as their application in structural design. Mirroring the full process chain in the simulation approach of designing new parts provides the means to shorten development time and to reduce cost for experimental testing. Based on DIGIMAT unique technology, the nonlinear, anisotropic, temperature- and strain-rate dependent material properties for short- and continuous-fiber reinforced plastics are accurately predicted. This paper will demonstrate the basic idea and workflow of DIGIMAT for the modeling of (thermo-) mechanical behavior, NVH, crash-worthiness, or fatigue in advanced multi-scale simulation models.

Michael Parrott, e-Xstream engineering

Multi-Scale Modeling of Fatigue of Fiber Reinforced Plastics with DIGIMAT

This presentation deals with the prediction of the high-cycle fatigue behavior of polymer-matrix composites, based on mean-field homogenization. We present the basis of the mean-field homogenization formulation and illustrate the methodology through the analysis of the fatigue properties (i.e. SN curve) of fiber-reinforced materials having different microstructures. Such fatigue modeling using DIGIMAT allows analysis of the sensitivity of the fatigue properties to fiber orientation and the nature of the applied load.
**Paul Deslauriers, Multimatic Engineering**

*Finite Element Modeling of Bond-Line Read-Through in Composite Automotive Body Panels Subject to Elevated Temperature Cure*

The current paper discusses the FEA-based approach to predict bond-line read-through (BLRT), which can occur when bonding Class A SMC body-panel assemblies. A parametric joint parameter study is reviewed as background, and the results of a lab-scale coupon study are presented in which measured curvature results are compared to FEA predictions and good qualitative agreement is found. Additional analytical panel studies are presented that indicate that BLRT is a localized phenomenon so that the overall panel geometry does not influence the local BLRT severity. However, changes in local panel geometry can influence the BLRT severity.

**Libby Berger, General Motors Co. / USCAR**

*Material Properties of a Fabric Sheet Molding Compound for a Structural Composite Underbody*

The Automotive Composites Consortium (ACC) has selected a fabric sheet molding compound (SMC) as the main material and compression molding as the process system for a structural composite underbody. This paper describes the properties of this SMC material, including tensile, compression, and flex. Thermal properties including coefficient of linear thermal expansion and thermal transition temperatures were determined. The effect of two different fabric weights, and molding temperatures is also reported. Overlap and butt joints within the layup were compared.

**FINALIZING THE DESIGN & DEVELOPMENT OF A STRUCTURAL COMPOSITE UNDERBODY – PART 1:**

**Libby Berger, General Motors Co. / USCAR**

*Program Summary of the ACC Automotive Composites Underbody*

A structural composite underbody capable of carrying crash loads has been designed, fabricated, assembled into a structure, and tested by the Automotive Composites Consortium. The underbody is compression molded of glass fabric sheet molding compound (SMC). Design was via CAE-based methodologies, and the molded underbody was weld bonded to a steel BIW structure. The underbody structure was tested to simulate an offset deformable-barrier crash, and the results compared to design.

**Charles Knakal, USCAR**

*Manufacturing Scenarios & Challenges with a Fabric SMC Automotive Underbody*

Compression molding of fabric SMC in steel tooling is a cross between prepreg molding and regular sheet molding compound (SMC) molding. Material processing differences, such as minimal material flow, represent major manufacturing challenges requiring different approaches for production operations. This paper will present the observed challenges and potential approaches that will enable cost-effective manufacturing scenarios. Aspects of the processing include (but are not limited to) SMC compounding, charge cutting, charge placement, tool loading, edge filling of the part, wrinkles and overlaps, part trimming, modeling, and material testing. Presented will be solutions we utilized, in addition to studies and cost models used to alleviate some concerns.

**FINALIZING THE DESIGN & DEVELOPMENT OF A STRUCTURAL COMPOSITE UNDERBODY – PART 2:**

**Justin Hunt, AET Integration Inc. / USCAR**

*Fatigue Performance of SMC Composite Material under Different Environmental Damage & Temperature Conditions*

The fatigue performance of SMC under different environmental and impact-damaged conditions is explored. The effects of stress, loading frequency, and environmental temperature on localized heating is explained.

**Hannes Fuchs, Multimatic Engineering / USCAR**

*Status of the Composite Underbody Component & Assembly Structural Test-Analysis Correlation*

2011 SPE ACCE Best Paper Award Winner

The paper will discuss the preparation and fabrication underbody test assemblies, the structural stiffness and modal performance testing of trimmed underbody molded components and assemblies, and the destructive testing of assemblies. The predicted performance was investigated for two composite thickness assumptions to account for the additional thickness observed in the prototype components. Predictions were then compared to the measured test results to understand the status of correlation between the response of idealized components and the as-molded prototype test components. Predictions were found to be in good agreement with testing.
ADVANCES IN THERMOPLASTIC COMPOSITES – PART 1: Enhancing Polypropylene

Scott Miller, Dow Corning Corp.

Closing the Gap Between Polypropylene and Polyamide Composites with New Silane Grafting Technology from Dow Corning

A breakthrough has been made that will significantly improve the performance of polypropylene (PP) composites, thereby reducing the performance gap between PP and polyamide. Novel silane technology has been discovered allowing for the coupling of glass fibers to PP, as well as cross-linking neat PP, while minimizing polymer degradation. The presentation will show the improvements in performance, when compared to homopolymer and maleic anhydride grafted PP (MAgPP), including improvements in thermal stability, mechanical performance, aging under various conditions, and more.

Yan Jin, SINOPEC Beijing Research Institute of Chemical Industry

Analysis of Polypropylene Odor Based on Electronic Olfactory System

In this work, the undesirable odor from neat PP was evaluated using an electronic olfactory system equipped with 18 metal-oxide semi-conductor sensors. Odor of PP and the effects of heating temperature and heating time on the odor from different grades of PP resin were studied. It was found that the odor of PP resin could be detected by the electronic olfactory system quickly and accurately and significant effects of heating time and heating temperature above 50°C on the release of the odor was observed, with the odor intensity of PP resin increasing with the increase of heating temperature and heating time.

Joseph George, Quadrant Plastic Composites

Lightweight Design of Structural Parts with Thermoplastic Composites

Glass mat thermoplastic (GMT) composites have been available for many decades. Recent developments in woven-fabric reinforced GMT, as well as improved computer simulations have enabled the material to be used in new applications that previously were designed solely in steel. This presentation will focus on utilizing computer simulations and best design practices in order to specify the most appropriate GMT formulation for a given application.

ADVANCES IN THERMOPLASTIC COMPOSITES – PART 2: Enhancing Polypropylene

Creig Bowland, PPG Industries, Inc.

A Formulation Study of Long Fiber Thermoplastic Polypropylene (Part 3): Mechanical Properties of PP DLFT Composites

In part three of this multiyear study, the properties and performance of PP DLFT are explored using a Coperion-based DLFT compression-molding system. An extensive formulation DOE was initiated to determine the performance of PP DLFT and to compare and contrast this work with the prior work done on PP GLFT. The results of this ongoing research are reported.

K.B. Thattaiparthasarthy, University of Alabama at Birmingham

Colored Inorganic Pigmented Long Fiber Thermoplastics

This work establishes a comprehensive understanding of the effects of colored inorganic pigments in long fiber pellets. The ability to integrate color in LFT products in the manufacturing step eliminates the need for secondary painting. Pigment variables such as particle size, distribution, chemistry, and coatings and their influence on the strength of the final part have been investigated.

John Klein, Asahi Kasei Plastics North America

High Performance Engineered Polypropylene Compounds for High Temperature Automotive Under-the-Hood Applications

Over the years, plastic composite air-intake manifolds made of glass-filled nylon 6 and 66 have replaced their metal counterparts. While nylon has been an ideal material for these demanding underhood applications, optimized polypropylene compounds are proving that they are able to perform equally well in these high-temperature operating environments. This paper introduces a new polymer innovation: a high-temperature glass-reinforced polypropylene compound. Key performance attributes will be compared to incumbent materials and the material’s suitability for underhood applications will be explored.
ADVANCES IN THERMOPLASTIC COMPOSITES – PART 3: Applications Update

C.H. Choi, Hyundai Motor Co.

**Recent Thermoplastic Composites for Automotive Applications**

Recently, Hyundai & Kia Motors have developed many kinds of composites based on polypropylene (PP) and have tried to apply these for the exterior, interior, chassis, and body parts. The company has achieved good results, which helped reduce part costs as well as weight.

Marcia Kurcz, Polyscope Polymers B.V.

**Automotive Sunroof Systems & Frames in Xiran® SMA/ABS**

Automotive sunroof systems have become popular options on many classes of vehicle owing to their ability to enhance comfort and styling. Sunroof components, particularly frames, need to meet a wide range of technical requirements, with a clear focus on dimensional stability, functional integration, safety, and cost and weight reduction. Current metal and plastic designs used for sunroof frames do not adequately meet these application needs. However, an engineering thermoplastic – glass-reinforced SMA/ABS – long used on vehicle interiors is increasingly being considered on sunroof components owing to its unique combination of precision molding capabilities, compatibility with sunroof adhesives, fast processing, lower systems cost and weight, and ability to be recycled.

Thomas Russell, Allied Composite Technologies LLC

**Thermoplastic Composite Structural Strut**

This presentation will describe Air-Frame™, a novel low-mass, high-strength composite strut member made in a high-productivity process. The technology is compatible with a wide variety of thermoplastics and continuous-strand reinforcements and creates a helical braided design with a very-high stiffness / weight ratio. Potential applications are various structural components as well as crash and energy-management systems.

ADVANCES IN THERMOPLASTIC COMPOSITES – PART 4: High-Temperature Matrices

Bob Newill, Ticona Engineering Polymers

**Aerospace & Automotive Seat Frames from Carbon & PPS Thermoplastic Tape**

In both the automotive and aerospace industries, seat frames are typically multipiece aluminum designs and can represent a significant proportion of total seat and vehicle weight. Both industries also face pressures to reduce mass (to increase fuel efficiency) and to contain or reduce production costs. New materials and process options that reduce mass and increase functionality are welcome, but must be cost-competitive with current aluminum systems. An award-winning seat frame and seat back using high-performance thermoplastic tapes of PPS resin and carbon fiber have been shown to meet aerospace performance requirements and are currently being evaluated by seat suppliers. They also show promise of meeting automotive cost and production targets.

Steve Mok, DuPont Automotive

**Superior Resistance to Thermo-Oxidative & Chemical Degradation in Polyamides & Polyphthalamides**

DuPont™ SHIELD technology allows polyamide and polyphthalamide (PPA) resins to be used at higher temperatures than could be previously achieved. This technology combines several innovations, including a new polymer backbone, polymer modifications, and a special set of additives to enhance performance. Resistance to thermo-oxidative damage and chemical degradation is highly superior vs. standard polyamide resins. Examples of improved performance, including resistances to hot air oven aging at 210°C, hot automotive oils, and calcium chloride cracking will be discussed.

Charlie Costello, Ticona Engineering Polymers

**Thermoplastics for High-Temperature Composite Processes & Applications**

The high-temperature, high-mechanical performance end of the composite materials spectrum has long been dominated by thermoset matrices with continuous-strand, unidirectional fiber or fabric reinforcements. However, that is starting to change as thermoplastic resin suppliers position their own high-temperature offsets in this segment – not just as lower cost, lower weight, faster processing replacement for thermosets, but as direct metal replacements themselves. This paper provides an overview of current market pressures supporting growth of high-performance thermoplastics, and then reviews processing options for high-performance composites with thermoplastic as well as thermoset matrices. Next, several short case histories involving conversions to thermoplastic matrices directly from metals are presented.

ADVANCES IN COMPOSITE REINFORCEMENT TECHNOLOGIES – PART 1: New Options for Improving Mechanicals

Kipp Grumm, BASF Corp & Amit Kulkarni, Faurecia

**Thermoplastic Overmolded Continuous Fiber Structures**

The technology of over-molding continuous fiber inserts to achieve strong, lightweight composite parts allows for the additional benefits of feature integration and parts consolidation. This technology can be used with nearly any polymer and reinforcing fiber. To illustrate the versatility of this technology, we will present a case study on a seat back produced with glass-reinforced nylon 6, including discussion of adhesion with the continuous fiber insert, CAE methods, and correlation with actual testing.
Benjamin Hangs, Fraunhofer Institut für Chemische Technologie
Integration of Features into Parts Made from Thermoplastic, Unidirectional Tape – Overview and Case Study
2010 SPE ACCE Scholarship Award Winner
The paper presents an overview of desired features that are commonly part of complex technical applications. It shows how implementation of those can be achieved with continuous-fiber-reinforced structures by combining them with short and long fiber-reinforced material. In a case study, an investigation on over-molding of unidirectional tape inserts is presented.

Timo Huber, Fraunhofer Institut für Chemische Technologie
Local Continuous Fibre-Reinforcement – Tailored Injection Moulding >> Lightweight Potential for Injection Molding Parts <<
Weight reduction of components is becoming increasingly important, for example in automotive applications where significant fuel savings and CO2 emission reduction can be made. The limited mechanical properties, such as stiffness and impact strength, prohibit the use of injection moulded parts in higher load-bearing applications. The high potential of local continuous fibre reinforcement under static and dynamic load conditions is presented.

ADVANCES IN COMPOSITE REINFORCEMENT TECHNOLOGIES – PART 2: New Options for Improving Mechancials
Jackie Rehkopf, Plasan Carbon Composites
Sustainability with Automotive Carbon Fibre Composites: Reclaimed Carbon Fibre – cPBT Thermoplastic Composite
During the development and deployment of more carbon fibre composites in the automotive industry, consideration is also given to sustainability aspects. Partnering with Materials Innovation Technologies and Cyclics Corp., Plasan Carbon Composites is developing a new addition to its portfolio that uses reclaimed carbon fibre in a thermoplastic matrix that emits no volatile organic compounds (VOCs) during production or in-service life. The presentation will provide details on the carbon fibre reclaima- tion, the processing with cyclic polybutylene terephthalate (cPBT) resin for a high fibre content, and preliminary properties of the composite to guide component application targets.

Uday Vaidya, University of Alabama at Birmingham
Hybrid Thermoplastic Composites with High Strength Embedded Metal Cords - Static & Impact Behavior
Hybrid materials featuring thermoplastic polymer composites in conjunction with high-strength steel cords can be used as structural materials in commercial transport, trucks, mass transit, and military vehicles. The synergy of metal cords with thermoplastic composites in terms of mechanical and chemical treatment of the interphase, pull-out, and impact has been investigated.

Uday Vaidya, University of Alabama at Birmingham
Mechanical & Impact Response of Recycled Thermoplastic & Flyash Foam Composites
The heavy transport industry has a significant amount of scrap generated in the manufacture of parts such as trailer bodies and structural components. Presently, that scrap is landfilled. This paper presents the processing and resulting properties of recycled thermoplastic composites into useful products for reuse in transportation and related applications.

NANOCOMPOSITES
Martin Bureau, National Research Council Canada
Selective Compatibilization for Stiffer, High Impact TPO/Clay Nanocomposites
Different compatibilization strategies from masterbatch mixing with a twin-screw extruder with various coupling agents were investigated to improve the stiffness of nanocomposites using a high-impact TPO. Based on impact and microstructural analysis results, it is concluded that organoclay act on the rubbery phase to increase the toughening effect in the TPO, presumably by increasing the cavitation stress of the TPO.

Xian Jiang, Michigan State University
Synthesis of Bipolar Plates for Fuel Cells Based on Exfoliated Graphene Nanoplatelets Filled Polymeric Nanocomposites 2011 SPE ACCE Best Paper Award Winner
The objective of this research was to investigate the potential of using exfoliated graphene nanoplatelets (GNP) as the conductive filler to construct highly conductive polymeric nanocomposites to substitute for conventional metallic and graphite bipolar plates in the polymer electrolyte membrane (PEM) fuel cells. It is believed that the bipolar plates made from HDPE/GNP nanocomposites will allow lighter weight PEM fuel cells to be produced with enhanced performance that is particularly suited for automotive applications.

W.H. Katie Zhong, Washington State University
Enabling Faster Resin Infusion Processing of Automotive Composites: A “Nano-Nectar” Technology Leading Epoxy to High Performance and Low Viscosity 2011 SPE ACCE Best Paper Award Winner
A “nano-nectar” technology is used to make nanofillers into liquid nano-reinforcement (LNR) acting as a “nano-nectar” for making nano-epoxy. The LNR can easily be dispersed in the base epoxy matrix and proves highly effective for reinforcing and toughening the epoxy resin. It also contributes to dramatically reducing viscosity, which is significant to FRP composites manufacturing energy efficiency (reduced power requirements for flow and part consolidation).
KEYNOTE SPEAKERS

John Schweitzer, American Composites Manufacturers Association
NTP’s Cancer Assessment for Styrene – Science, Policy and Implications
Despite several authoritative weight-of-the-evidence assessments supporting a conclusion that styrene does not pose a cancer risk, in June the U.S. Department of Health & Human Services National Toxicology Program (NTP) listed styrene as a “reasonably anticipated” carcinogen in the NTP Report on Carcinogens. ACMA is concerned that the impact of this listing on composite manufacturers may include increased worker turnover, loss of community goodwill, increased costs for liability insurance, unwarranted tort claims, and problems obtaining financing or selling a business. With its industry partners, ACMA is campaigning aggressively to overturn the NTP listing. The campaign includes 2 major ongoing scientific studies, seeking an authoritative review by the National Academy of Sciences, legal action against NTP, and efforts aimed at developing support in Congress. In addition, ACMA provides tools for its members to communicate with employees and plant neighbors about styrene health risk.

C. David Warren, Oak Ridge National Laboratory
Lower Cost Carbon Fiber in High Volumes for 21st-Century Industries – The Obstacles to Getting There
There has been great excitement about the potential for using carbon fiber-reinforced composites during the last few years in high-volume applications. Currently, the largest hurdle to broad implementation in transportation, infrastructure, and consumer goods is the high cost of carbon fiber itself vs. other candidate materials. As part of the U.S. Department of Energy’s (DOE’s) Vehicle Technologies and Industrial Technologies Programs, significant research is being conducted to develop lower cost, high-volume capable technologies for producing and using carbon fiber. To date, new precursor materials and processing technologies have been developed that offer the potential for a future type of lower cost, moderate performance, high-volume, commodity grade of carbon fiber. This presentation will highlight ongoing research and the potential future applications of less expensive fibers, as well as cover other obstacles beyond cost and provide suggestions for approaches to overcoming those challenges.

Antony Dodworth, Dodworth Design
Stiffer is Better: Lessons Learned in Composites Design of Lightweight Automotive Structures
With all the pressure to take weight out of vehicles these days, both aluminum and carbon composites-intensive architectures have gotten a lot of attention. An alternative approach is to use a hybrid materials design that meets functional objectives of performance and cost that otherwise are not achievable with a mono-material system. By picking the best of new materials and assembly methods to meet volume and investment, novel designs can be produced that solve long-established problems. This presentation describes a clean-sheet design for a 2+2 sports car that incorporates lessons learned throughout a career working on both aluminum- and carbon-intensive vehicles for the racing and supercar segments.

Chuck Kazmierski, Program Manager, Lucintel
Growth Opportunities in Global Composites Market 2011-2016
The composites industry is already sustainable with over 30,000 applications worldwide. There are positive signs of healthy, visible growth in the gradual rebound of the automotive, construction, electronics, and consumer-goods markets. Right now, there are numerous external forces that are reshaping the composites industry – population growth, new infrastructure projects, urbanization, increases in middle-class populations in the developing world, and the green movement. These pressures will help ensure growth stays strong for the foreseeable future, especially in the Brazil/Russia/India/China (BRIC) region.

Patrice Sinthon, JEC Group
Main Trends & Dynamics of the Worldwide Composites Industry
Over the last decade, JEC Group has become the world’s largest industry organization, serving the complete value chain of the composites industry and providing a network that connects 250,000 professionals in 96 countries. The organization joins science, technology, and business through six areas of expertise: connecting opportunities (tradeshows in Europe, Asia, & the Americas), information channels (web hub, magazines, and eNewsletters), learning resources (end-users forums, conferences, workshops, and technical demonstrations), business intelligence (strategic studies), a publications library, and innovations programs (including regional and international design competitions). The American composites industry has a strong record for high-volume usage with automated processes coupled with good design and development expertise. This market looks prosperous through 2015 and beyond. Hence, JEC has joined with the Industrial Fabrics Association International (IFAI) for its newest tradeshow in Boston, November 7-9, 2012. This presentation will discuss benefits of participating in this new show, as well as provide industry forecasts drawn from JEC market research.

Nathan Armstrong, Motive Industries
Return of the Small Car Maker
Over the last decade, the pace of technology has advanced in all fields of design and manufacturing at an unparalleled pace thanks to a number of useful tools, like CAD, rapid prototyping, CNC milling, new plastics and composites technologies, and the knowledge and experience to combine all these elements into “the second industrial revolution.” The impact this has had on industry is unquestionably enabling the largest shift in influence ever seen. The small guys now have the same tools as the big guys, but often with more freedom and flexibility to demonstrate applications in technology that the large companies cannot. When design freedom and access to advanced materials, such as fibre-reinforced plastics are combined, the possibility of the small automaker re-emerges.
Ashish Diwanji, Owens Corning

**Winning with Composites in a World Seeking Sustainable Solutions**

Oil price volatility, supply security concerns, and an ever-increasing and consuming population have created significant global issues with repercussions that are being felt today and may continue for decades to come. Faced with this situation, we must develop solutions to meet problems head-on. For the composites industry, such challenges represent opportunity for business growth in markets ranging from automotive to alternative energy to building infrastructure. As a part of this solution, use of glass composites helps deliver preferable, sustainable solutions for our world. Converting traditional materials to composites can enhance energy efficiency and productivity since composite parts consume less energy, emit fewer greenhouse gases, and offer the additional benefits of greater durability, corrosion resistance, longer term aesthetics, and added safety. With tools like Life Cycle Assessment (LCA), the industry has a methodology for calculating and communicating the relative eco-benefits of composites applications.

David Lashmore, Nanocomp Technologies, Inc.

**Carbon Nanotube Composites Fabricated from Multwall Carbon Nanotube (MWCNT) Mat**

Carbon nanotubes are nearly immune to corrosion and fatigue in composites at nominal operating conditions. At the nanolevel, they are also very stiff and strong, yet incredibly lightweight, all of which makes them highly desirable as structural reinforcements for composites. However, the challenge has been to find ways to integrate nanotubes and other nanoparticles into a resin matrix successfully in order to take advantage of their unique properties. Nanocomp Technologies Inc. was formed to leverage its proprietary technology for the production of long carbon nanotubes together with a unique ability to fabricate them into physically strong, lightweight, electro-thermally conductive fibers, yarns, and felts to create a new generation of advanced structural materials and electro-energy devices. This presentation reviews the synthesis of single, dual, and multiwall CNT types into large sheets or high-strength CNT-based fibers used to produce prepreg and net-shape articles for multifunctional polymeric composites with very-high CNT loadings.

Mark Voss, General Motors Co.

**GM’s Lightweighting Strategy for Composites**

The justification for future composite executions is evolving rapidly at GM. This presentation will review the current status of composite executions at GM and discuss what is required for future applications.

PANEL DISCUSSIONS:

**The Role of Composites in Battery Cases & Trays for Fleet Electrification**

**Moderator: Drew Winter, Editor-in-Chief, Ward’s AutoWorld**

**Confirmed Panelists:**

Jim Dutchik, Business Development Manager, Asahi Kasei North America; Frank Henning, Deputy Director, Fraunhofer ICT; Kestutis Sonta, Senior Materials Engineer, General Motors Co.; Joe Bodary, Manager-Engineering & Prototype, Continental Structural Plastics

Battery packs that power hybrid- and battery-electric vehicles (HEVs & BEVs) bring their own special challenges for vehicle designers, yet provide an excellent opportunity for composites to shine. First, batteries are heavy, making it important that trays be structural and able to support significant mass without creeping over a wide range of temperatures for the life of the vehicle. Furthermore, owing to consumer “range anxiety” and the desire to extend practical driving range on these vehicles, it is highly desirable to take weight out wherever possible. Still another challenge is that batteries are caustic, so it is important that both cases and trays be corrosion resistant and able to withstand the aggressive chemicals inside. Last, metal-oxide batteries operate at high temperatures, so materials for battery cases and trays need to also provide sufficient thermal performance. This panel discussion will evaluate the challenges and opportunities presented by fleet electrification and the materials technologies that are working and those that are not.

**Measuring the Sustainability Proposition of Composites**

**Moderator: Jeff Sloan, Editor-in-Chief, CompositesWorld.com**

**Confirmed Panelists:**

Shristy Bashyal, Graduate Student, University of Missouri; Ashish Diwanji, Vice-President of Innovation, Owens Corning; Antony Dodworth, Managing Director, Dodworth Design; C. David Warren, Program Manager-Transportation Materials & Carbon Fiber, Oak Ridge National Laboratory; Jaap van der Woude, Director-Science & Technology Europe, Environmental, PPG Industries; Mark Voss, Lead Composites Engineer, General Motors Co.

The automotive industry faces numerous new green initiatives, including end-of-life materials recovery, significantly boosting average vehicle fuel economy, and reducing its carbon dioxide (CO₂) footprint—both during production and throughout the use life of its vehicles. This makes it increasingly important for the composites industry to be able to provide quantitative data on just how sustainable composites are as a materials technology vs. metallic alternatives. However, defining just what is green and how that should be measured is a significant hurdle at present. This panel discussion will evaluate some of the more useful tools currently available, such as life-cycle analysis (LCA), and consider how to accurately and fairly begin the process of quantifying the sustainability proposition of composites.
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Since 1998, the Detroit Section of the Society of Plastics Engineers (SPE) International has organized the SPE Automotive TPO Global Conference to update attendees on the latest developments in thermoplastic olefinics (TPOs). Now in its 13th year, the show is the world’s leading automotive olefins forum featuring 40+ technical presentations, panel discussions, keynote speakers, networking receptions, & exhibits that highlight advances in poly-olefin materials, processes, and applications technologies as well as a growing range of thermoplastic elastomers (TPEs) and thermoplastic vulcanizates (TPVs). This year’s show will be held October 2-5, 2011 at the Troy-Marriott and will feature sessions on Materials Development, Engineered Polyolefin Compounds, Applications Development, Surface Enhancements, TPO/TPV Interfaces, and a new session on Polyolefin Foams & Advances in Olefin Processes.

Interact With an Engaged, Global Audience

The SPE Automotive TPO Global Conference typically draws over 400 attendees from 20 countries on 4 continents who are vitally interested in learning about the latest in rigid and elastomeric TPO as well as TPE and TPV technologies. Fully a third of conference attendees work for a transportation OEM, and roughly 20% work for a tier integrator. Few conferences of any size can provide this type of networking opportunity with such an engaged, global audience vitally interested in hearing the latest olefin advances.

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David Inglefield, a Ph.D. candidate pursuing a dual degree in Chemistry and Biomedical Engineering at Virginia Polytechnic Institute & State University (Virginia Tech, Blacksburg, Va.), is the 2011-2012 winner of an SPE Automotive Composites Conference & Exhibition (ACCE) graduate-level scholarship for transportation composites research. Inglefield, who is from Fairfax, Va. and expects to graduate in 2014, won this year’s scholarship for a research project involving the synthesis of functionalized carbon nanotubes for optimized properties in polymer composites, a project that could have broad application in automotive composites.

As Inglefield explains, since their discovery in 1991, interest in carbon nanotubes (CNTs) has grown rapidly and their use has expanded into areas as diverse as electronics and bionanotechnology. One of their most promising areas of usage is to improve the properties of polymer composites by increasing mechanical strength (without raising resin weight or density as most reinforcements do) and conferring electrical and thermal conductivity to materials that normally provide neither property. However, wider usage has been limited by many factors, including high production costs and challenges effectively dispersing the nanoparticles into polymer matrices. Developing a functionalized CNT that effectively interacts with the resin in which it is incorporated remains a significant challenge in expanding usage of this technology.

David Inglefield holds a B.S. degree in Biochemistry from Virginia Tech, which he received in 2009. Since graduating, he has worked as a graduate research assistant under his undergraduate and graduate research advisor, Dr. Timothy E. Long, professor of chemistry and associate dean of Strategic Initiatives, Department of Chemistry, College of Science at Virginia Tech. The focus of their graduate work together has been synthesis and characterization of novel functionalized multiwall carbon nanotubes (MWCNT) and MWCNT composites. Inglefield’s undergraduate work with Long involved synthesis and characterization of cinnamate functionalized ultraviolet (UV) cross-linkable ammonium ionenes. Since receiving his undergraduate degree, Inglefield also has worked as teaching assistant (undergraduate Organic Chemistry lab for non-majors) at Virginia Tech and has been an American Chemistry Society (ACS) short-course presenter, where he was responsible for demonstrating various polymerization techniques. His current research expertise is in organic functionalization of MWCNT for polymer composites; electrospinning of polymers and MWCNT composites; performing transmission-electron and scanning-electron microscopy, nuclear magnetic-resonance spectroscopy, differential scanning calorimetry, thermogravimetric analysis, Raman and infrared spectroscopy, cryomicroscopy, dynamic light-scattering analysis, and rheology. In addition he has co-authored two publications presented at industry conferences.

Thomas (Tom) G. Loken, a doctoral candidate in Mechanical Engineering at University of Wisconsin-Madison (Madison, Wisc.) as well as a project engineer at The Madison Group (Madison, Wisc.), is the second 2011-2012 winner of an SPE Automotive Composites Conference & Exhibition (ACCE) graduate-level scholarship in transportation composites research. Loken, who is from Winona, Minn. and expects to graduate in 2014, won this year’s second scholarship for a research project analyzing the effects of processing conditions on fiber-length distribution in short-fiber composites.

Short-fiber thermoplastic composite materials are widely used in the automotive industry. These materials offer enhanced mechanical properties over unfilled resins, yet remain viable for high-volume production methods, such as injection molding, making metals replacement cost-effective thanks to parts consolidation, weight reduction, and elimination of secondary-finishing operations. However, the mechanical properties of fiber-filled composites are strongly influenced by orientation and length/diameter (L/D) ratios of reinforcing fibers, making final part properties highly dependent upon processing conditions. In the case of injection molding, fiber damage and attrition can occur during processing, reducing final L/D ratio. Therefore it is useful to understand which process parameters have the greatest effect on final fiber-length distribution.

Thomas Loken holds a B.S. degree in Composite Materials Engineering from Winona State University (Winona, Minn.), which he received in 2009. During his undergraduate studies he worked as a testing intern at the school’s Composite Materials Technology Center (COMTEC), where he conducted mechanical and analytical testing on composites and plastics. He also worked as a process engineering intern at RTP Co. (Winona, Minn.) in the extrusion/compounding of thermoplastics and short-fiber composites. At RTP, Loken was responsible for SPC charting, corrective actions, and process studies. After graduating, he served as the manufacturing engineer at Rolco Inc. (Kasota, Minn.) where he managed work instructions, corrective action requests, and process optimization, and project-managed four family tools used to produce automotive parts with glass-filled polyamide – from mold inspection, to sampling, to production. Loken also conducted considerable research – using factorial screening experiments, response surface experiments, and validation – on secondary spin-welding operations for these parts to ensure a hermetic seal was achieved. He is currently a project engineer at The Madison Group where he conducts failure analysis of plastics and provides consulting services to the plastics community. Loken is concurrently a full-time graduate student in the Mechanical Engineering department at the University of Wisconsin-Madison working with Drs. Tim Osswald and Paul Gramann.
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For the third time in three years, the SPE Automotive Composites Conference & Exhibition (ACCE) is hosting a student poster competition showcasing emerging technologies in the area of automotive and ground-transportation composites. This year’s competition features separate undergraduate as well as graduate classifications and is being co-sponsored by SPE’s Automotive and Composites Divisions (who co-organize the conference) and PPG Industries, which has donated monetary awards totaling $3,000 USD that will be given to the top three poster topics in both graduate and undergraduate categories.

Judges made up of media, industry experts, and SPE board members will review all posters on the first day of the conference. Students and their posters will be judged on 10 aspects, including content (student and poster demonstrate clarity of topic, objectives, and background; motivation for research and technical relevance to conference theme; methodology and approach to problem; quality of proposed research results / findings; conclusion are supported by information presented); presentation (display aesthetics are pleasing; there is a logical flow between sections; presenter has a good grasp of the subject; plus poster is understandable and effective even without student being present to explain it); and overall rank vs. other posters and presenters. Kevin Richardson, market development manager, PPG Industries will announce this year’s winners on the morning of the second day of the show.

For the last three years, the SPE Automotive Composites Conference & Exhibition (ACCE) is hosting a student poster competition showcasing emerging technologies in the area of automotive and ground-transportation composites. This year’s competition features separate undergraduate as well as graduate classifications and is being co-sponsored by SPE’s Automotive and Composites Divisions (who co-organize the conference) and PPG Industries, which has donated monetary awards totaling $3,000 USD that will be given to the top three poster topics in both graduate and undergraduate categories.

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Currently, 13 students from eight universities – the largest pool of entrants yet – have submitted paperwork to participate in this year’s competition (Auburn University, Georgia Institute of Technology, Michigan State University, Oklahoma State University, Tuskegee University, University of Akron, UAB, University of Southern Mississippi, and Wright State University).

In 2010, 10 posters from six schools (North Dakota State University, Oklahoma State University, Tuskegee University, UAB, University of Michigan-Dearborn, and University of Mississippi-Oxford) were entered into the competition and both monetary prizes and plaques were donated by SPE. The three winners that year were Alfred Tcherti-Nateh, Tuskegee University (first place); Shaun Crawford, UAB (second place); and K. Lakshminarayan, Oklahoma State University (third place).

In 2009, the first year of the competition, 11 posters from five schools (North Dakota State University, Tuskegee University, UAB, University of Michigan-Dearborn, and University of Mississippi-Oxford) were entered and the winners were: Michael Fuqua, North Dakota State University and K. Balaji Thattai, UAB (tied for first place); Tiffany Nelson, Tuskegee University (second place); and Shiva Shankaran, University of Michigan-Dearborn. That year, Dow Chemical donated monetary prizes of $500 USD, which were split among the four winners, who also received plaques to honor their efforts.

For the last three years, the poster competition has been organized by Dr. Uday Vaidya, SPE Composites Division board member and Education chair, and professor and director-Engineered Plastics & Composites Group in the Department of Materials Science & Engineering at University of Alabama-Birmingham (UAB).
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**When:** Monday, September 12th, from 5:30 - 7:00 PM.

**Where:** Room 104, SPE ACCE Conference in the Management Education Center

If you can't join us for the meeting please be sure to stop by the cocktail reception sponsored by the Automotive Composites Alliance on **September 13th at 6:15pm**, to see friends, network, and hear a little more about how you can get involved!

As government and industry looks for more ways to lightweight and create greener vehicles, composites has a major role to play! The Automotive Composites Alliance aims to bring likeminded businesses together, determine what goals we need to focus on together, and then leverage the resources of member companies and the ACMA to better the business opportunities for all. This is your chance to be a part of deciding which direction the Automotive Composites Alliance heads in and get involved!

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